

NWCA Field Operations Manual Training Packet

**National Water Quality Monitoring Conference
Sunday, April 25th, 2010**



**Demonstration and Training in the
National Wetland Condition Assessment Field Protocols**
National Water Quality Monitoring Conference
April 25, 2010
Denver, CO

Goal: Demonstrate the National Wetland Condition Assessment Field Protocols for State and Tribal partners.

Objectives

1. Provide participants with a sense of the level of effort and expertise needed to complete the NWCA field protocols.
2. Solicit technical and logistical feedback on the protocols

Training Agenda Overview:

- 7:45 am: Convene at hotel lobby: Sign in, pay for lunch, and fill out **waiver** and **emergency contact** forms.
- 8:30 am: Board Buses. Mike Scozzafava provides NARS/NWCA background. Create small groups.
- 9:00 am: Arrive at Wetland Site
- 9:15 am: Assessment Area Primer (ALL PARTICIPANTS). **Brief** orientation of the standard AA. Detailed information will be provided at Station 1.
- 9:30 am: Begin **55 minute** rotating demonstration stations (SMALL GROUPS):
- Station 1: Assessment Area and Buffer Characterization Protocols
 - Trainer(s): Elizabeth Riley (EPA), Gregg Serenbetz (EPA), Chris Faulkner (EPA)
 - Station 2: Vegetation Protocols
 - Trainer(s): Teresa Magee (ORD), Joanna Lemly (CO NHP)
 - Station 3: Soils and Hydrology Protocols
 - Trainer(s): Regina Poeske (EPA), Mary Anne Thiesing (EPA)
 - Station 4: USA RAM Protocols
 - Trainer(s): Josh Collins (SFEI)
- 10:25 am: Break/ Change demonstration station
- 10:30 am: Rotating demonstration stations (SMALL GROUPS)
- 11:25 am: Break/ Change demonstration station

11:30 am: Rotating demonstration stations (SMALL GROUPS)

12:30 pm: Boxed Lunch (Provided)

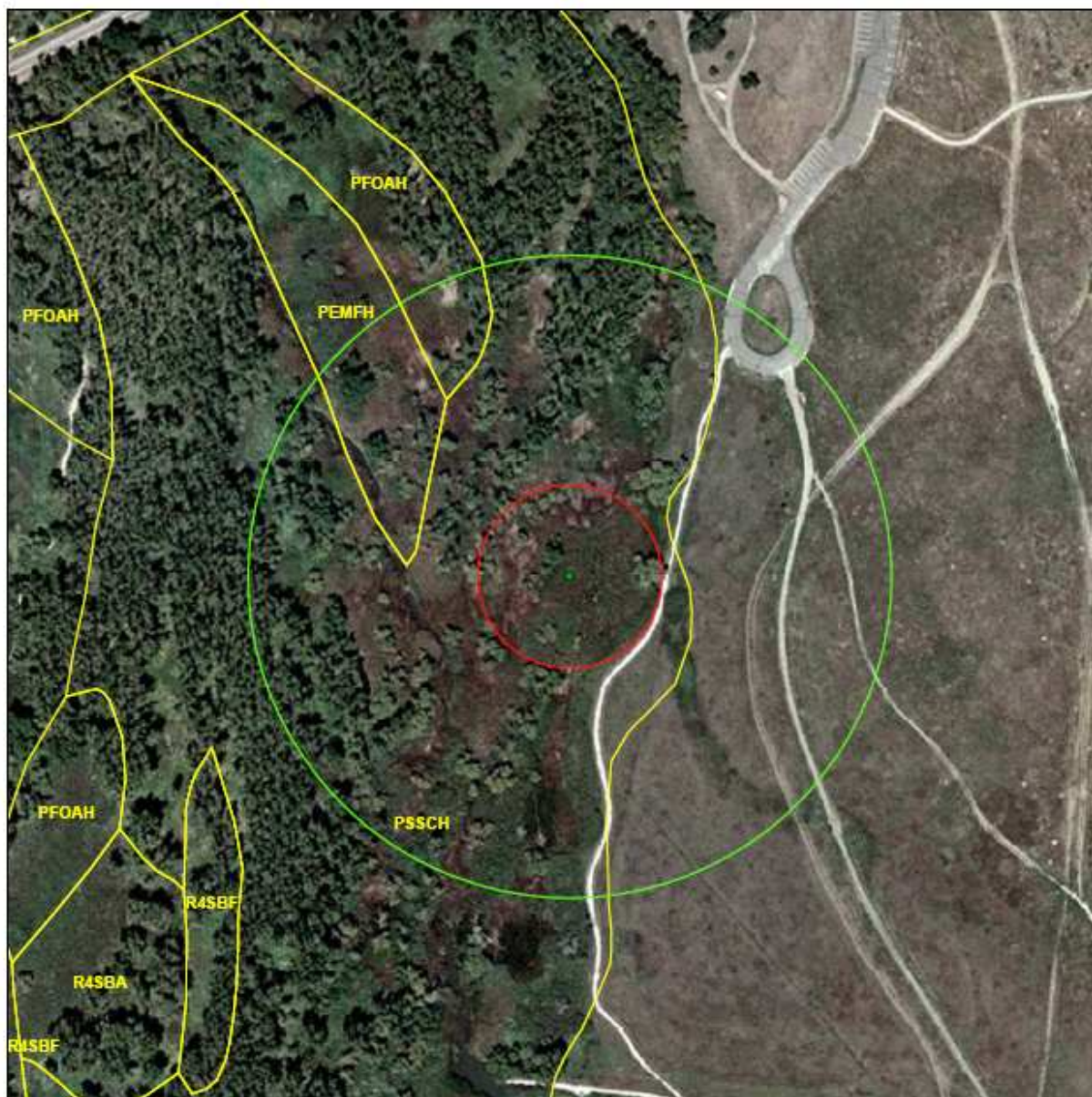
1:30 pm: Rotating demonstration stations (SMALL GROUPS)

2:25 pm: Break/ Reconvene in large group

2:30 pm: “Hypothetical” discussion at 2nd site

3:00 pm: Reconvene for Questions and Comments

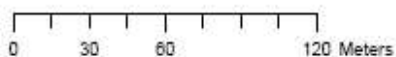
3:30 pm: Board Buses to Return to Hotel- fill out **Training Evaluation**



County, St: Arapahoe, CO
 Latitude: 39.62239
 Longitude: -104.83165
 Wetland Class: PSS
 Panel: Revisit
 Ownership: State Land
 Name: Cherry Creek State Park

Denver Field Training Site A

Map Scale 1:2,500

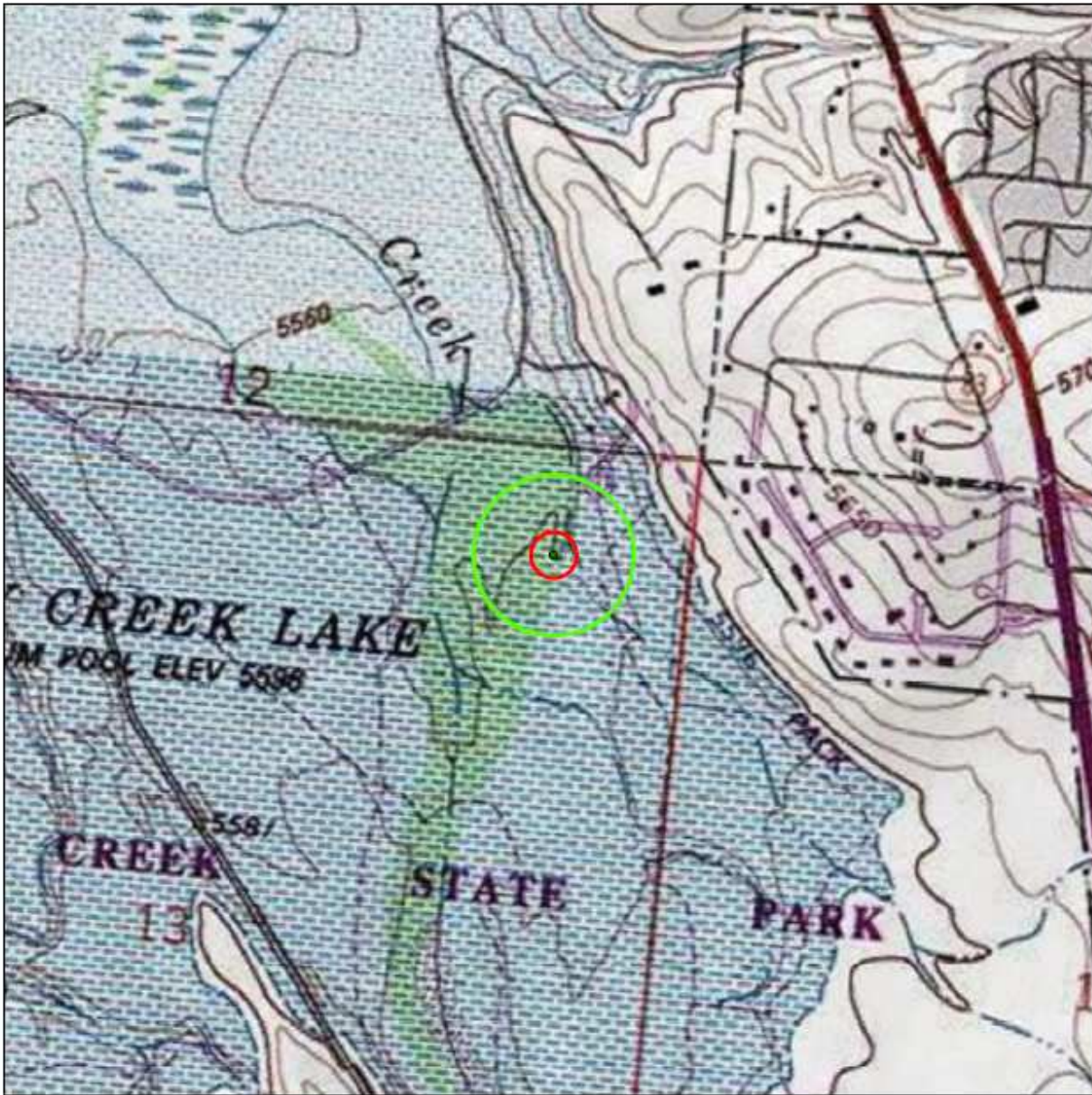


- Sample Point
- 40 meter Assessment Area
- 100 meter Buffer
- CherryCreekSP_NWI

Imagery Information:
 Layer Title: World Imagery
 Sources: ESRI, i-Cubed, USDA FSA, USGS, AEX,
 GeoEye, Getmapping
 URL: <http://services.arcgis.com/arcgis/services>

Projection: Albers
 Central_Meridian: -96.000000
 Standard_Parallel_1: 29.500000
 Standard_Parallel_2: 45.500000
 Latitude_Of_Origin: 23.000000
 Datum: D_North_American_1983





Map Scale: 1:10,000

0 120 240 480 Meters

Denver Field Training Site A

Target Wetland Type: PSS
Era 2010 Classification: PSS
Era 2005 Classification: PSS
Era 2000 Classification: PSS

Predominant Surrounding Land Use
within the Assessment Area and Buffer:

PEM 8%
PSS 50%
PFO 2%
UB 40%

Imagery Information:
Layer Title: World Imagery
Sources: ESRI, i-cubed, USDA FSA, USGS, AEX,
GeoEye, Getmapping
URL: <http://services.arcgis.com/arcgis/services>

Projection: Albers
Central_Meridian: -96.000000
Standard_Parallel_1: 29.500000
Standard_Parallel_2: 45.500000
Latitude_Of_Origin: 23.000000
Datum: D_North_American_1983

EPA United States
Environmental Protection
Agency



A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Arapahoe County, Colorado

NWCA Training Site

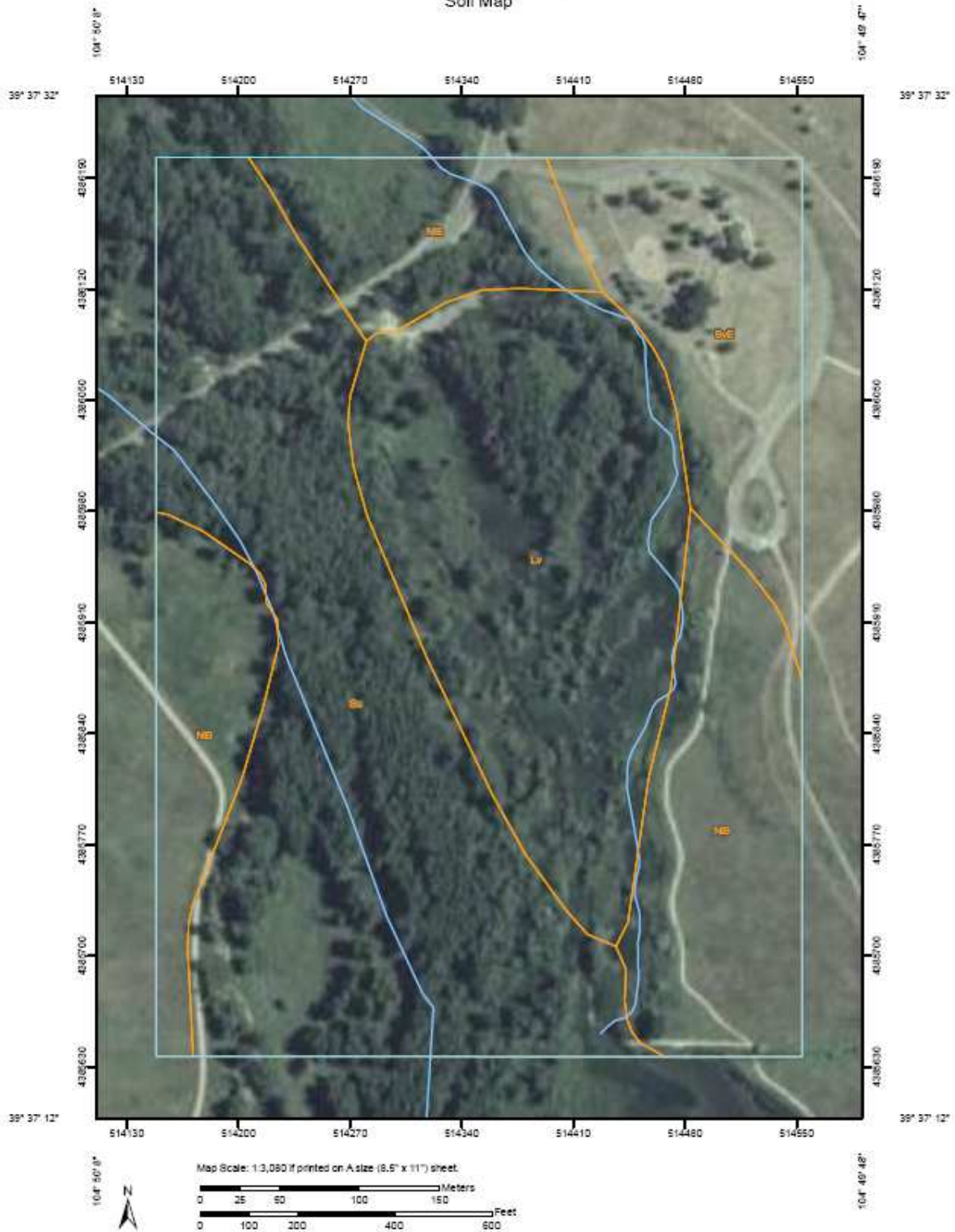


April 21, 2010

Soil Map


The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map




Custom Soil Resource Report




MAP LEGEND

Area of Interest (AOI)
 Area of Interest (AOI)

Soils
 Soil Map Units

Special Point Features

-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot
-  Spoil Area
-  Stony Spot

-  Very Stony Spot
-  Wet Spot
-  Other



Special Line Features

-  Gully
-  Short Steep Slope
-  Other





Political Features

-  Cities

Water Features

-  Oceans
-  Streams and Canals

Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

MAP INFORMATION

Map Scale: 1:3,080 if printed on A size (8.5" x 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
 Coordinate System: UTM Zone 13N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Arapahoe County, Colorado
 Survey Area Data: Version 8, May 1, 2009

Date(s) aerial images were photographed: 7/30/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Arapahoe County, Colorado (CO005)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BvE	Bresser-Truckton sandy loams, 5 to 20 percent slopes	6.6	11.7%
Lv	Loamy alluvial land	14.5	25.6%
NIB	Nunn loam, 0 to 3 percent slopes	15.1	26.6%
Su	Sandy alluvial land	20.5	36.1%
Totals for Area of Interest		56.7	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments

Custom Soil Resource Report

on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Arapahoe County, Colorado

BvE—Bresser-Truckton sandy loams, 5 to 20 percent slopes

Map Unit Setting

Elevation: 4,500 to 6,800 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 125 to 180 days

Map Unit Composition

Bresser and similar soils: 50 percent
Truckton and similar soils: 35 percent
Minor components: 15 percent

Description of Bresser

Setting

Landform: Drainageways, stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Noncalcareous sandy alluvium and/or noncalcareous sandy eolian deposits

Properties and qualities

Slope: 5 to 20 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water capacity: Very high (about 13.0 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability (nonirrigated): 6e
Ecological site: Sandy Foothill (R049BY210CO)

Typical profile

0 to 5 inches: Sandy loam
5 to 16 inches: Sandy clay loam, clay loam
16 to 28 inches: Sandy loam, coarse sandy loam, gravelly sandy loam
28 to 60 inches: Loamy coarse sand, gravelly loamy sand

Description of Truckton

Setting

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits

Custom Soil Resource Report

Properties and qualities

Slope: 5 to 20 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.9 inches)

Interpretive groups

Land capability (nonirrigated): 6e
Ecological site: Sandy Foothill (R049BY210CO)

Typical profile

0 to 5 inches: Sandy loam
5 to 17 inches: Sandy loam
17 to 60 inches: Sandy loam

Minor Components

Ascalon

Percent of map unit: 10 percent

Nunn

Percent of map unit: 5 percent

Lv—Loamy alluvial land

Map Unit Setting

Elevation: 4,000 to 6,000 feet
Mean annual precipitation: 11 to 15 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 165 days

Map Unit Composition

Loamy alluvial land: 85 percent
Minor components: 15 percent

Description of Loamy Alluvial Land

Setting

Landform: Flood plains, drainageways, streams
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Properties and qualities

Slope: 0 to 3 percent
Drainage class: Well drained

Custom Soil Resource Report

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.20 to 2.00 in/hr)

Frequency of flooding: Occasional

Calcium carbonate, maximum content: 15 percent

Gypsum, maximum content: 1 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)

Available water capacity: High (about 10.7 inches)

Interpretive groups

Land capability classification (irrigated): 2w

Land capability (nonirrigated): 6w

Ecological site: Overflow (R067BY036CO)

Typical profile

0 to 6 inches: Loam

6 to 60 inches: Stratified loam to clay loam

Minor Components

Nunn

Percent of map unit: 10 percent

Satanta

Percent of map unit: 5 percent

Landform: Paleoterraces

NIB—Nunn loam, 0 to 3 percent slopes

Map Unit Setting

Elevation: 4,500 to 6,700 feet

Mean annual precipitation: 12 to 18 inches

Mean annual air temperature: 46 to 54 degrees F

Frost-free period: 115 to 180 days

Map Unit Composition

Nunn and similar soils: 85 percent

Minor components: 15 percent

Description of Nunn

Setting

Landform: Streams, stream terraces

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Eolian deposits

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Custom Soil Resource Report

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 15 percent

Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)

Available water capacity: Very high (about 21.7 inches)

Interpretive groups

Land capability (nonirrigated): 3c

Ecological site: Loamy Plains (R067BY002CO)

Typical profile

0 to 3 inches: Loam

3 to 22 inches: Clay loam, clay

22 to 60 inches: Sandy clay loam, fine sandy loam, sandy loam

Minor Components

Ft collins

Percent of map unit: 5 percent

Heldt

Percent of map unit: 5 percent

Beckton

Percent of map unit: 5 percent

Su—Sandy alluvial land

Map Unit Setting

Elevation: 2,500 to 4,500 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 48 to 52 degrees F

Frost-free period: 110 to 160 days

Map Unit Composition

Sandy alluvial land: 95 percent

Minor components: 5 percent

Description of Sandy Alluvial Land

Setting

Landform: Streams, drainageways

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Sandy alluvium and/or loamy alluvium

Properties and qualities

Slope: 0 to 2 percent

Drainage class: Somewhat excessively drained

Custom Soil Resource Report

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)

Frequency of flooding: Frequent

Calcium carbonate, maximum content: 10 percent

Available water capacity: High (about 11.0 inches)

Interpretive groups

Land capability (nonirrigated): 6w

Typical profile

0 to 10 inches: Sand

10 to 60 inches: Fine sand, sand, loamy sand

Minor Components

Bresser

Percent of map unit: 5 percent

**NWCA Field Operations Manual
Chapters 3 and 4 Training Packet**

Assessment Area and Buffer

**National Water Quality Monitoring Conference
April 25th, 2010**

3.4 EQUIPMENT AND SUPPLIES

Data forms and reference cards

Site packet with maps with POINT marked, directions to the POINT, access information

GPS loaded with coordinates for the POINT, manual, extra battery pack

Compass

Laser rangefinder with extra batteries (optional, but desirable)

Surveyor's flagging tape to mark the POINT and boundaries of the assessment area

Indelible markers to write on flagging

Metallic balloon or aluminum foil to use as reflective surface for sighting

Pole for attaching balloon or foil for sighting

String for tying balloon or foil to a pole or woody vegetation

50-m or 100-m measuring tape with reel for situations where range finder does not work

FORM AA-1: ASSESSMENT AREA ESTABLISHMENT

Site Name: _____ Date: ____/____/2011

Site ID #: NWCA11-____ Team: _____

1) Was an AA established? ☐ Yes Proceed to question 2
 ☐ No Document the reasons below and follow
procedures for selecting an alternate POINT in the NWCA Site Evaluation Guidelines.

2) Does the AA contain the original POINT? ☐ Yes Proceed to "AA Layout Used"
 ☐ No Document the reasons below and
follow procedures for POINT relocation in the NWCA Site Evaluation Guidelines.

AA Layout Used (check one):

____ Standard Layout ____ Alternate Layout 2a ____ Alternate Layout 3
____ Alternate Layout 1 ____ Alternate Layout 2b

Location of Center of AA (check one):

____ The POINT is the center
____ The POINT is not the center; the coordinates of the center are:

Latitude North: ____ . ____

Longitude West: ____ . ____

Make sure that the GPS is set to reference the NAD 83 geospatial data set.

FORM AA-1: ASSESSMENT AREA ESTABLISHMENT

Site ID #: NWCA11-____ _

Date: ____/____/2011

SKETCH MAP

With a fine-point Sharpie or similar pen, draw the AA boundary on the aerial photo in the site packet and indicate the position of the AA center (if not the POINT) with a "star" and the vegetation plots with a "V." Include the annotated photo with this form.

Use the space below for developing a plan for establishing the AA. Update in the field. Include the AA boundary, location of POINT, AA center, and a north arrow. Provide the dimensions of the AA and bearings and distances needed to set up the type of AA layout appropriate to the site. Indicate the positions of the vegetation plots by squares with plot numbers. If appropriate, note nature and direction of environmental gradients, water bodies, major vegetation patches, and other prominent features of the site and surrounding area.



FORM AA-2: ASSESSMENT AREA CHARACTERIZATION

Site Name: _____ Date: ____/____/2011

Site ID #: NWCA11-____ Team: _____

Wetland Type

FWS Status and Trends Class – Check predominant type:

- ☐ Estuarine Intertidal Emergent (E2EM)
- ☐ Estuarine Intertidal Scrub Shrub/Forested (E2SS)
- ☐ Palustrine Emergent (PEM)
- ☐ Palustrine Scrub Shrub (PSS)
- ☐ Palustrine Forested (PF)
- ☐ Palustrine Farmed (not currently in crop production) (Pf)
- ☐ Palustrine Unconsolidated Bottom/Aquatic Bed (PUBPAB)

Check predominant subclass:

- ☐ Palustrine Aquatic Bed (PAB)
- ☐ Pond – Aquaculture (PUBa)
- ☐ Pond – Agriculture (PUBf)
- ☐ Pond – Natural (PUBn)
- ☐ Pond – Urban (PUBu)

Hydrogeomorphic Classes – Check type:

- ☐ Depression Closed
- ☐ Depression Closed – Human Excavated
- ☐ Depression Closed – Human Impounded
- ☐ Depression Closed – Human Excavated and Impounded
- ☐ Depression Open
- ☐ Depression Open – Human Excavated
- ☐ Depression Open – Human Impounded
- ☐ Depression Open – Human Excavated and Impounded
- ☐ Flats Mineral Soil
- ☐ Flats Organic Soil
- ☐ Lacustrine Fringe
- ☐ Lacustrine Artificially Flooded
- ☐ Riverine Tidal
- ☐ Riverine Upper Perennial (1st or 2nd order stream)
- ☐ Riverine Lower Perennial (3rd order or higher stream)
- ☐ Slope Topographic
- ☐ Slope Stratigraphic
- ☐ Tidal Fringe

Other Wetland Classification Systems: Complete to document the dominant wetland type using other wetland classification systems, e.g., a state classification system.

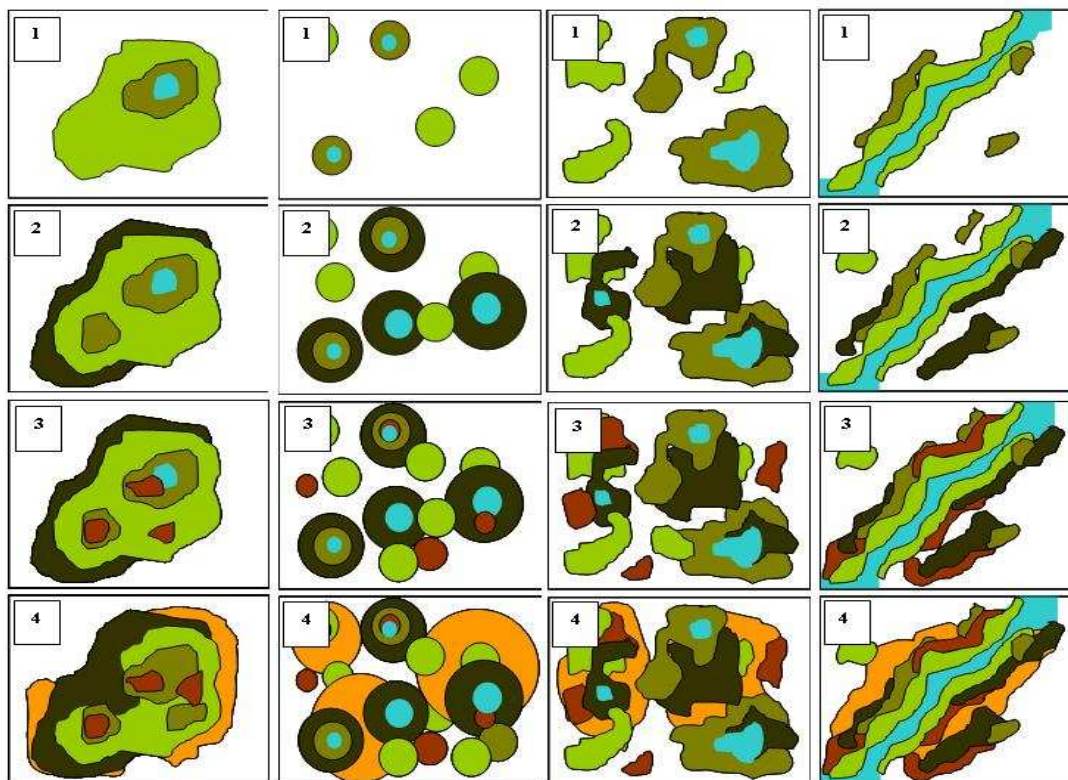
System:_____ Wetland Class:_____

System:_____ Wetland Class:_____

FORM AA-2: ASSESSMENT AREA CHARACTERIZATION

Site Name: _____ Date: __ __/ __ __/2011

Select the diagram that most closely resembles the situation in the AA from the matrix below of alternative mosaics representing different patch diversity and interspersion.¹



Circle the row number of the diagram selected:

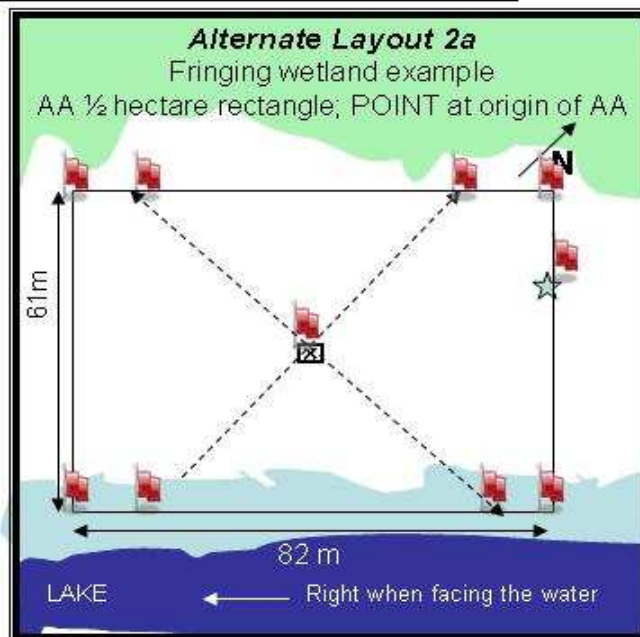
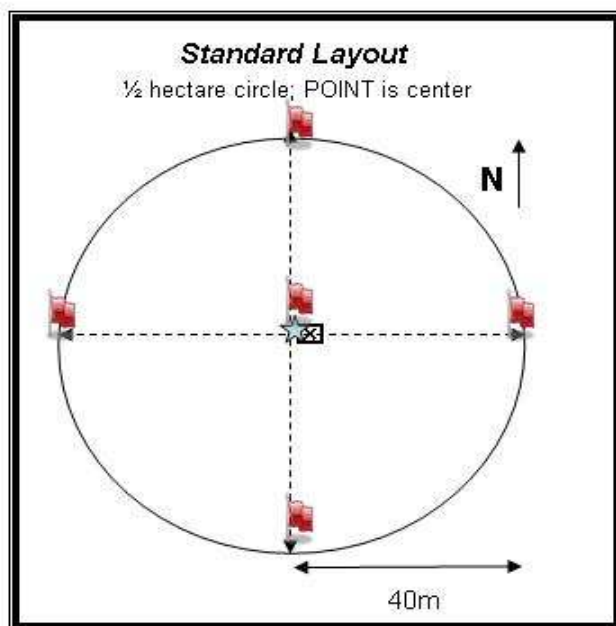
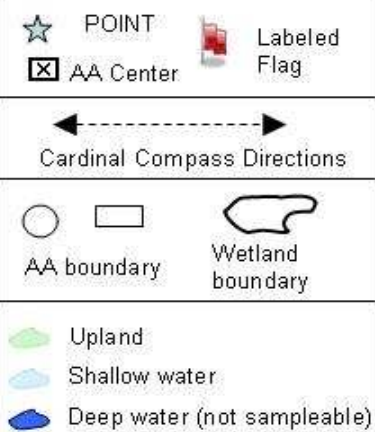
1**2****3****4**

¹ From Collins, J. and Fennessy, M.S. in prep. USA Rapid Assessment Method.

Reference Card AA-1. Assessment Area Establishment – Side A

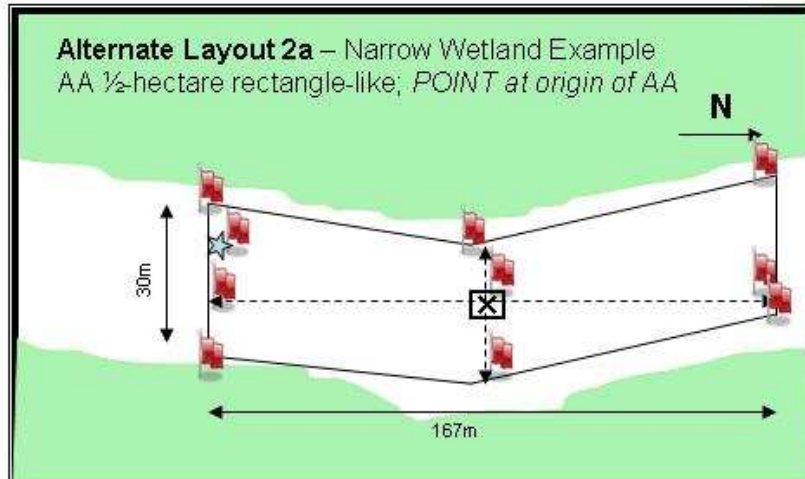
Key to Assessment Area (AA) Layouts

- 1a** Sampleable area is $\geq \frac{1}{2}$ ha and can contain a circular plot with a diameter of 80 m
2a POINT is the center of the sampleable area..... *Standard AA Layout*
2b POINT is not the center of the sampleable area..... *Alternate AA Layout 1*
- 1b** Sampleable area is $\geq \frac{1}{2}$ ha and can contain a rectangular plot with a width ranging from a minimum of 20 m (with a length of 250 m) and maximum of 79.5 m (with a length of 63 m)
3a POINT is at the origin of the AA..... *Alternate Layout 2a*
3b POINT is not at the origin of the AA..... *Alternate Layout 2b*
- 1c** Sampleable area containing the POINT is $< \frac{1}{2}$ ha but > 0.1 ha..... *Alternate Layout 3*
- 1d** $> 10\%$ of the area within the AA Layout for the site is unsampleable area AND there is sufficient sampleable area within 60 m of the POINT..... *Follow procedures for POINT relocation in the NWCA Site Evaluation Guidelines and return to establishing the AA*

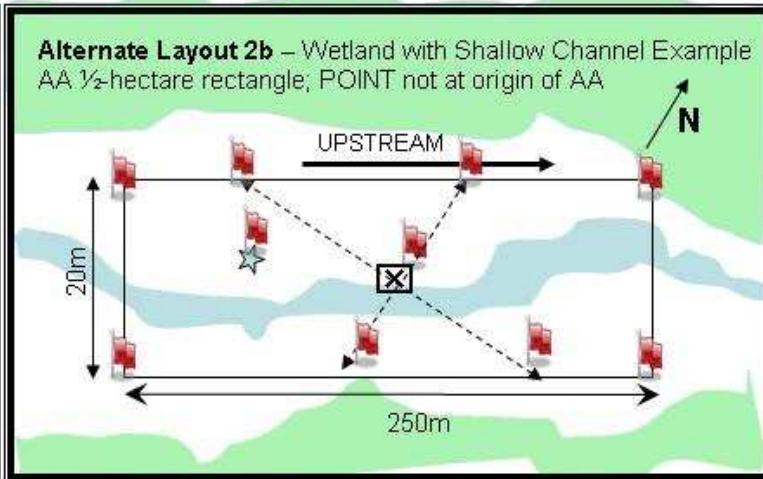


Reference Card AA-1 Assessment Area Establishment – Side B – More Examples of Layout Configurations

Alternate Layout 2a – Narrow Wetland Example
AA ½-hectare rectangle-like; *POINT* at origin of AA

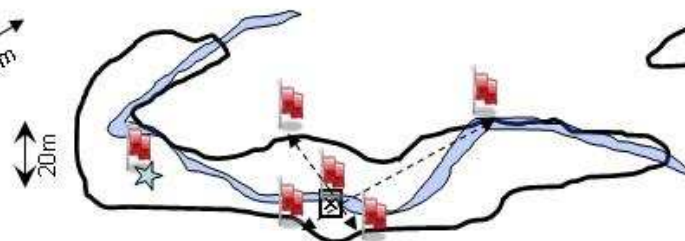
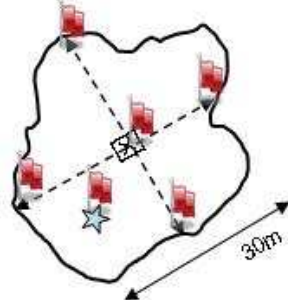


Alternate Layout 2b – Wetland with Shallow Channel Example
AA ½-hectare rectangle; *POINT* not at origin of AA

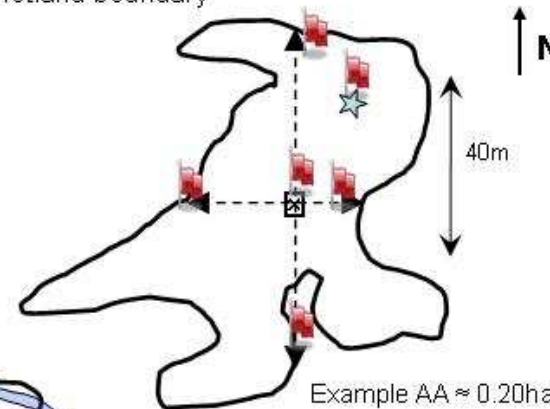


Alternate Layout 3 – Small Wetland Examples; AA (0.1ha to < 0.5ha) = wetland boundary

Example AA \approx 0.14ha



Example AA \approx 0.22ha



Example AA \approx 0.20ha

Reference Card AA-2. FWS Status and Trends Classes Included in the NWCA¹

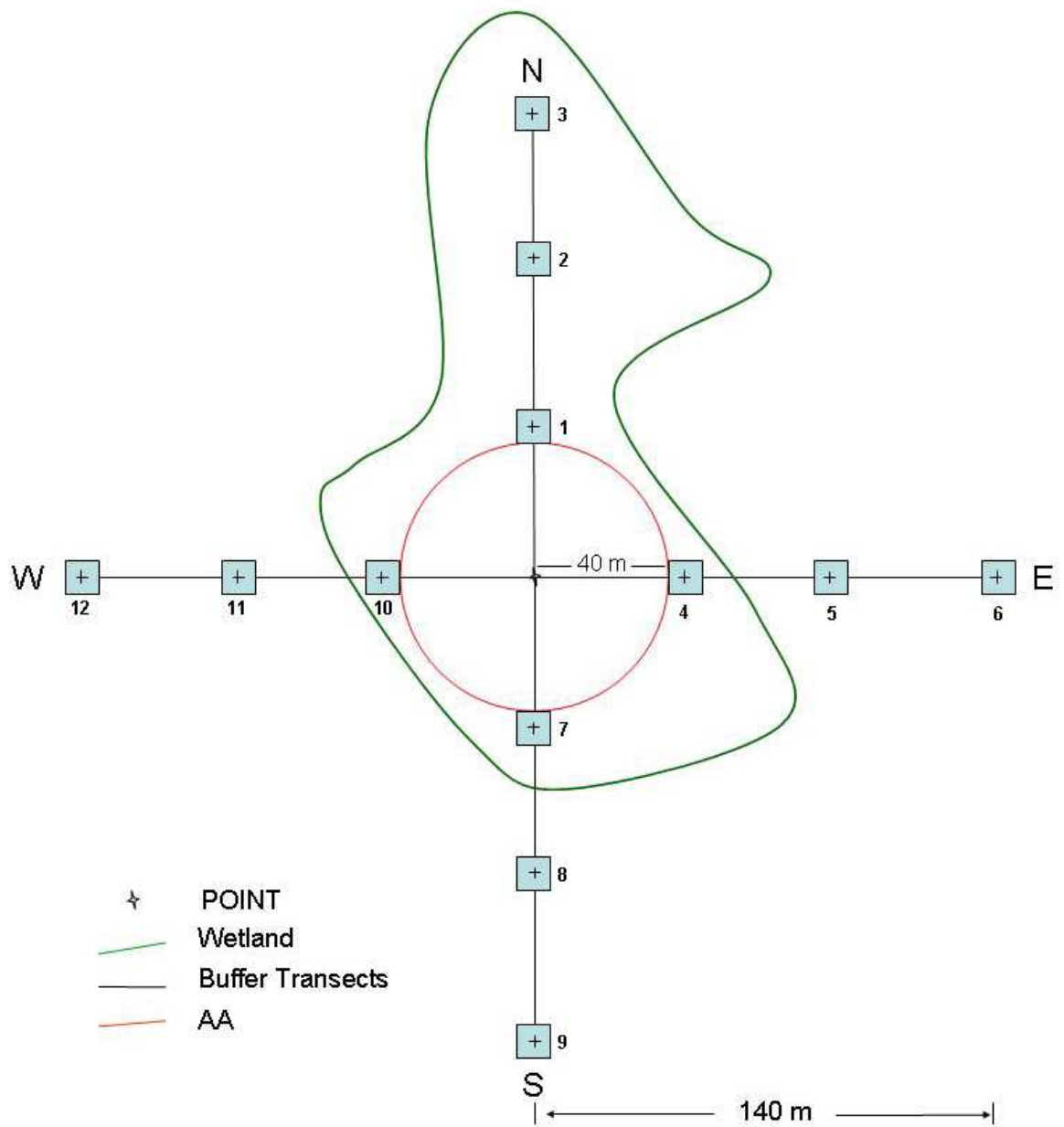
CATEGORIES INCLUDED IN NWCA				
Code	Subcode	Full Name	Common Description	Technical Description ²
E2EM		Estuarine Intertidal Emergent	Salt marsh	Emergent wetlands in estuarine systems characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants.
E2SS		Estuarine Intertidal Scrub Shrub / Forested	Mangroves Other estuarine shrubs	Shrub wetlands in estuarine systems that are dominated by woody vegetation less than 20 feet (6 meters) tall. The species include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. Forested wetlands are characterized by woody vegetation that is 6 meters tall or taller.
PEM		Palustrine Emergent	Inland marshes Wet meadows	Emergent wetlands in palustrine systems characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants.
PSS		Palustrine Scrub Shrub	Shrub wetlands	Shrub wetlands in palustrine systems that are dominated by woody vegetation less than 20 feet (6 meters) tall. The species include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions.
PFO		Palustrine Forested	Forested swamps	Forested wetlands in palustrine systems that are characterized by woody vegetation that is 6 meters tall or taller.
Pf		Palustrine Farmed	Farmed wetland	Farmed wetlands that meet the Cowardin et al. definition where the soil surface has been mechanically or physically altered for production of crops, but where hydrophytes will become reestablished if farming is discontinued.
PUBPAB		Palustrine Unconsolidated Bottom / Aquatic Bed	Ponds, aquatic beds	Aquatic beds are dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years. Examples include seagrass beds, pondweeds (<i>Potamogeton</i> spp.), wild celery (<i>Vallisneria americana</i>), waterweed (<i>Elodea</i> spp.), and duckweed (<i>Lemna</i> spp.).
	PAB	Palustrine Aquatic Bed	Intertidal freshwater seagrass beds Pondweeds	
	PUBf	Pond – Agriculture	Farm ponds Drainage water ponds	
	PUBn	Pond - Natural	Bog lakes Vernal pools Kettles Beaver ponds Alligator holes	
	PUBu	Pond - Urban	Aesthetic ponds Recreation ponds Golf course ponds Residential lakes Water retention ponds	
				Unconsolidated bottom includes all wetlands with at least 25 percent cover of particles smaller than stones, and a vegetative cover less than 30 percent. Examples of unconsolidated substrates are: sand, mud, organic material, cobble gravel.
				The wetlands must also have the following four characteristics: (1) area less than 20 acres (8 ha); (2) an active wave formed or bedrock shoreline features are lacking; (3) water depth in the deepest part of a basin less than 6.6 feet (2 meters) at low water; and (4) salinity due to ocean derived salts less than 0.5 parts per thousand.

² Descriptions are taken from Status and Trends of Wetlands in the Conterminous United States 1998 to 2004. U.S. Department of the Interior; Fish and Wildlife Service, Washington, D.C (Dahl 2006)

Reference Card AA-2. Key to Hydrogeomorphic Classes³

1. Wetland is under the influence of tides.....	2
1. Wetland is not under the influence of tides.....	4
2. Salinity greater than 5 ppt.....	Tidal Fringe
2. Salinity less than 5 ppt.....	Riverine Tidal
4. Wetland is topographically flat and precipitation is a dominant source of water.....	5
4. Wetland is not topographically flat and precipitation is not a dominant source of water.....	6
5. Wetland has a mineral soil.....	Flats Mineral Soil
5. Wetland has an organic soil.....	Flats Organic Soil
6. Wetland is associated with a nontidal stream channel, floodplain, or terrace.....	7
6. Wetland is not associated with a nontidal stream channel, floodplan, or terrace.....	9
7. Stream is 1 st or 2 nd order.....	Riverine Upper Perennial
7. Stream is 3 rd order or higher.....	Riverine Lower Perennial
7. Stream is constrained by a graminoid-dominated wetland supported primarily by groundwater.....	12
9. Wetland is fringing a lake or reservoir.....	10
9. Wetland is not fringing a lake or reservoir.....	11
10. Wetland inundation controlled by relatively natural hydroperiod.....	Lacustrine Fringe
10. Wetland inundation controlled by dam releases.....	Lacustrine Artificially Flooded
11. Wetland is primarily supported by ground water.....	12
11. Wetland is associated with a topographic depression.....	13
12. Water source is ground water discharged to the surface on the side of a hill due to a geologic feature, e.g., a confining layer.....	Slope Stratigraphic
12. Water source is ground water discharged at the toe-of-slope.....	Slope Topographic
13. Topographic depression without surface water inlets, outlets or other connections.....	14
13. Topographic depression with surface water inlets, outlets, or other connection.....	15
14. Wetland is a naturally occurring feature of the landscape.....	Depression Closed
14. Wetland is impounded by human activities.....	Depression – Closed Human Impounded
14. Wetland is excavated by human activities.....	Depression – Closed Human Excavated
14. Wetland is excavated and impounded by human activities.....	Depression – Closed Human Excavated and Impounded
15. Wetland is a naturally occurring feature of the landscape.....	Depression Open
15. Wetland is impounded by human activities.....	Depression – Open Human Impounded
15. Wetland is excavated by human activities.....	Depression – Open Human Excavated
15. Wetland is excavated and impounded by human activities.....	Depression – Open Human Excavated and Impounded

³ Adapted from Smith et al. 1995 and Brooks, 2008, and personal experience of M.E. Kentula, USEPA.



Buffer Assessment Layout

4.2 PROTOCOL CHECKLISTS AND SUMMARIES

- ___ Check equipment and supplies
- ___ Use GPS, range finder, and 50m tape if necessary to measure the location of each buffer sample plot as described in sections 4.1.1.1 and 4.1.1.2.
- ___ Record coordinates of each sample plot, natural cover strata information, and stressor data on field forms B-1 and B-2 at each sample plot. Go through all forms at each sample plot.
- ___ When all buffer sample plots are completed, review field forms for accuracy and complete *Totals* columns and/or *None* boxes.

4.3 EQUIPMENT AND SUPPLIES

The AB Team will need:

- ___ GPS
- ___ Field forms and clip board
- ___ 50 Meter tape
- ___ Laser Rangefinder
- ___ Compass to measure cardinal directions
- ___ Binoculars
- ___ Pin flag for temporary use
- ___ Aerial photo for each site from the site characterization packet

Team Initials: _____		B-1 Buffer Sample Plot Coordinates		Reviewed _____	
by: _____		Date: ____/____/____		Page ____ of ____	
Site ID: _____					

Buffer Plot	Latitude North (Center of Buffer Plot – Decimal Degrees)	Longitude West (Center of Buffer Plot – Decimal Degrees)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

Buffer Natural Cover Strata			
Vegetation Strata: Canopy Type and Vegetative Cover at 12 Buffer Plots (circle one for each entry)		D = Deciduous C = Coniferous E = Broadleaf Evergreen N = None	0 = Absent 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (> 75%)

1 Canopy Type Big Trees (> 0.3 m DBH) Small Trees (< 0.3 m DBH) Woody Shrubs (0.5m-5m), Saplings Woody shrubs (<0.5m) Non-woody Herbs, Grasses, and Forbs Bare dirt, duff Bedrock Water Wetland Vegetation	2 Canopy Type Big Trees (> 0.3 m DBH) Small Trees (< 0.3 m DBH) Woody Shrubs (0.5m-5m), Saplings Woody shrubs (<0.5m) Non-woody Herbs, Grasses, and Forbs Bare dirt, duff Bedrock Water Wetland Vegetation	3 Canopy Type Big Trees (> 0.3 m DBH) Small Trees (< 0.3 m DBH) Woody Shrubs (0.5m-5m), Saplings Woody shrubs (<0.5m) Non-woody Herbs, Grasses, and Forbs Bare dirt, duff Bedrock Water Wetland Vegetation
--	--	--

Team Initials: _____	Buffer Natural Cover Strata (continued)	Reviewed by: _____
Site ID: _____	Date: ____/____/____	Page ____ of ____

Vegetation Strata Canopy Type and Vegetative Cover at 12 Buffer Plots (circle one for each entry)	D = Deciduous C = Coniferous E = Broadleaf Evergreen N = None	0 = Absent 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (> 75%)
--	--	--

4 Canopy Type	D	C	E	N
Big Trees (> 0.3 m DBH)	0	1	2	3
Small Trees (< 0.3 m DBH)	0	1	2	3
Woody Shrubs (0.5m-5m), Saplings	0	1	2	3
Woody shrubs (<0.5m)	0	1	2	3
Non-woody Herbs, Grasses, and Forbs	0	1	2	3
Bare dirt, duff	0	1	2	3
Bedrock	0	1	2	3
Water	0	1	2	3
Wetland Vegetation	0	1	2	3

5 Canopy Type	D	C	E	N
Big Trees (> 0.3 m DBH)	0	1	2	3
Small Trees (< 0.3 m DBH)	0	1	2	3
Woody Shrubs (0.5m-5m), Saplings	0	1	2	3
Woody shrubs (<0.5m)	0	1	2	3
Non-woody Herbs, Grasses, and Forbs	0	1	2	3
Bare dirt, duff	0	1	2	3
Bedrock	0	1	2	3
Water	0	1	2	3
Wetland Vegetation	0	1	2	3

6 Canopy Type	D	C	E	N
Big Trees (> 0.3 m DBH)	0	1	2	3
Small Trees (< 0.3 m DBH)	0	1	2	3
Woody Shrubs (0.5m-5m), Saplings	0	1	2	3
Woody shrubs (<0.5m)	0	1	2	3
Non-woody Herbs, Grasses, and Forbs	0	1	2	3
Bare dirt, duff	0	1	2	3
Bedrock	0	1	2	3
Water	0	1	2	3
Wetland Vegetation	0	1	2	3

7 Canopy Type	D	C	E	N
Big Trees (> 0.3 m DBH)	0	1	2	3
Small Trees (< 0.3 m DBH)	0	1	2	3
Woody Shrubs (0.5m-5m), Saplings	0	1	2	3
Woody shrubs (<0.5m)	0	1	2	3
Non-woody Herbs, Grasses, and Forbs	0	1	2	3
Bare dirt, duff	0	1	2	3
Bedrock	0	1	2	3
Water	0	1	2	3
Wetland Vegetation	0	1	2	3

8 Canopy Type	D	C	E	N
Big Trees (> 0.3 m DBH)	0	1	2	3
Small Trees (< 0.3 m DBH)	0	1	2	3
Woody Shrubs (0.5m-5m), Saplings	0	1	2	3
Woody shrubs (<0.5m)	0	1	2	3
Non-woody Herbs, Grasses, and Forbs	0	1	2	3
Bare dirt, duff	0	1	2	3
Bedrock	0	1	2	3
Water	0	1	2	3
Wetland Vegetation	0	1	2	3

9 Canopy Type	D	C	E	N
Big Trees (> 0.3 m DBH)	0	1	2	3
Small Trees (< 0.3 m DBH)	0	1	2	3
Woody Shrubs (0.5m-5m), Saplings	0	1	2	3
Woody shrubs (<0.5m)	0	1	2	3
Non-woody Herbs, Grasses, and Forbs	0	1	2	3
Bare dirt, duff	0	1	2	3
Bedrock	0	1	2	3
Water	0	1	2	3
Wetland Vegetation	0	1	2	3

10 Canopy Type	D	C	E	N
Big Trees (> 0.3 m DBH)	0	1	2	3
Small Trees (< 0.3 m DBH)	0	1	2	3
Woody Shrubs (0.5m-5m), Saplings	0	1	2	3
Woody shrubs (<0.5m)	0	1	2	3
Non-woody Herbs, Grasses, and Forbs	0	1	2	3
Bare dirt, duff	0	1	2	3
Bedrock	0	1	2	3
Water	0	1	2	3
Wetland Vegetation	0	1	2	3

11 Canopy Type	D	C	E	N
Big Trees (> 0.3 m DBH)	0	1	2	3
Small Trees (< 0.3 m DBH)	0	1	2	3
Woody Shrubs (0.5m-5m), Saplings	0	1	2	3
Woody shrubs (<0.5m)	0	1	2	3
Non-woody Herbs, Grasses, and Forbs	0	1	2	3
Bare dirt, duff	0	1	2	3
Bedrock	0	1	2	3
Water	0	1	2	3
Wetland Vegetation	0	1	2	3

12 Canopy Type	D	C	E	N
Big Trees (> 0.3 m DBH)	0	1	2	3
Small Trees (< 0.3 m DBH)	0	1	2	3
Woody Shrubs (0.5m-5m), Saplings	0	1	2	3
Woody shrubs (<0.5m)	0	1	2	3
Non-woody Herbs, Grasses, and Forbs	0	1	2	3
Bare dirt, duff	0	1	2	3
Bedrock	0	1	2	3
Water	0	1	2	3
Wetland Vegetation	0	1	2	3

Team Initials: _____							B-2 Buffer Stressors Form							Reviewed by: _____	
Site ID: _____							Date: ____/____/____							Page: ____ of ____	
Hydrology Stressors							Habitat/Vegetation Stressors								
STRESSOR	TALLY	Total	01 02 03 04 05 06 07 08 09 010 011 012	01 02 03 04 05 06 07 08 09 010 011 012	01 02 03 04 05 06 07 08 09 010 011 012	01 02 03 04 05 06 07 08 09 010 011 012	STRESSOR	TALLY	Total	01 02 03 04 05 06 07 08 09 010 011 012	01 02 03 04 05 06 07 08 09 010 011 012	01 02 03 04 05 06 07 08 09 010 011 012	01 02 03 04 05 06 07 08 09 010 011 012		
Ditches, Channelization	None						Forest Clear Cut	None							
Dike/Dam/Road/RR Bed (impede flow)	None						Forest Selective Cut	None							
Water Level Control Structure	None						Tree Plantation	None							
Excavation, Dredging	None						Tree Canopy Herbivory (insect)	None							
Fill/Spoil Banks	None						Shrub Layer Browsed (wild or domestic)	None							
Freshly deposited sediment (unvegetated)	None						Heavily-Grazed Grasses (overall <3 in. high)	None							
Soil Loss/Root Exposure	None						Recently Burned Forest Canopy	None							
Wall/Riprap	None						Recently Burned Grassland (blackened)	None							
Inlets, Outlets	None						Herbicide/Defoliant Use	None							
Point source/Pipe (effluent or stormwater)	None						Mowing/Shrub Cutting	None							
Impervious surface input (sheetflow)	None						Trails	None							
Road - gravel	None						Soil compaction (animal or human)	None							
Road - two lane	None						Offroad vehicle damage	None							
Road - four lane	None						Soil erosion (from wind, water, or overuse)	None							
Other _____ (e.g., weir, chain tires)	None						Other _____	None							

Team Initials: _____

Site ID: _____

Reviewed by: _____

Page: _____ of _____

Date: ____/____/____

Buffer Stressors Form (continued)

Agricultural and Rural Stressors				Residential, Urban, and Industrial Development			
STRESSOR	TALLY	Total	BUFFER PLOTS	STRESSOR	TALLY	Total	BUFFER PLOTS
Pasture/ Hay	None		01 02 03 04 05 06 07 08 09 10 11 12	Golf Course	None		01 02 03 04 05 06 07 08 09 10 11 12
Range	None		01 02 03 04 05 06 07 08 09 10 11 12	Lawn/Park	None		01 02 03 04 05 06 07 08 09 10 11 12
Row Crops	None		01 02 03 04 05 06 07 08 09 10 11 12	Suburban Residential	None		01 02 03 04 05 06 07 08 09 10 11 12
Fallow Field (recent – resting row crop field)	None		01 02 03 04 05 06 07 08 09 10 11 12	Parking Lot/Pavement	None		01 02 03 04 05 06 07 08 09 10 11 12
Fallow Field (old –grass, shrub, or tree regrowth)	None		01 02 03 04 05 06 07 08 09 10 11 12	Urban/Multifamily	None		01 02 03 04 05 06 07 08 09 10 11 12
Nursery	None		01 02 03 04 05 06 07 08 09 10 11 12	Commercial/Industrial	None		01 02 03 04 05 06 07 08 09 10 11 12
Dairy	None		01 02 03 04 05 06 07 08 09 10 11 12	Landfill	None		01 02 03 04 05 06 07 08 09 10 11 12
Orchard	None		01 02 03 04 05 06 07 08 09 10 11 12	Trash/Dumping	None		01 02 03 04 05 06 07 08 09 10 11 12
Confined Animal Feeding	None		01 02 03 04 05 06 07 08 09 10 11 12	Gravel Pit	None		01 02 03 04 05 06 07 08 09 10 11 12
Rural Residential	None		01 02 03 04 05 06 07 08 09 10 11 12	Oil Field/Gas Wells	None		01 02 03 04 05 06 07 08 09 10 11 12
Irrigation	None		01 02 03 04 05 06 07 08 09 10 11 12	Mine (surface)	None		01 02 03 04 05 06 07 08 09 10 11 12

Targeted Alien Species (Presence/Absence in Buffer Sample Plots)

SPECIES NOT FINAL

Reed Canarygrass	None	01 02 03 04 05 06 07 08 09 10 11 12	Canada Thistle	None	01 02 03 04 05 06 07 08 09 10 11 12	Leafy Spurge	None	01 02 03 04 05 06 07 08 09 10 11 12
English Ivy	None	01 02 03 04 05 06 07 08 09 10 11 12	Musk Thistle	None	01 02 03 04 05 06 07 08 09 10 11 12	Giant Reed	None	01 02 03 04 05 06 07 08 09 10 11 12
Cheat Grass	None	01 02 03 04 05 06 07 08 09 10 11 12	Himalayan Blackberry	None	01 02 03 04 05 06 07 08 09 10 11 12	Common Burdock	None	01 02 03 04 05 06 07 08 09 10 11 12
Salt Cedar	None	01 02 03 04 05 06 07 08 09 10 11 12	Teasel	None	01 02 03 04 05 06 07 08 09 10 11 12	Russian Olive	None	01 02 03 04 05 06 07 08 09 10 11 12

**NWCA Field Operations Manual
Chapter 5 Training Packet**

Vegetation

**National Water Quality Monitoring Conference
April 25th, 2010**

NWCA Vegetation Protocol Task Checklist

Page 1

Pre-sampling and Plot Establishment Activities –

- 1) ___ Organize data forms and assemble Vegetation equipment (Section 5.1.1).
- 2) ___ Determine the Vegetation Plot Layout configuration and plot locations within the AA (Section 5.1.2, **Reference Card V-1**).
- 3) ___ Establish the five Vegetation Plots (Section 5.1.3, **Reference Card V-2, Side A**).

Preliminary and Continuous Data Collection Activities (Section 5.1.4.1) –

- 1) ___ Botanist/Ecologist makes all observations that require identification or cover estimation of individual plant species.
- 2) ___ Where convenient, the Botanist Assistant collects data on cover of vegetation strata, ground surface types, groups of non-vascular taxa, and count data for trees and snags.
- 3) ___ At other times, it will be more efficient for the Botanist/Ecologist and Botanist Assistant to work together with the Botanist Assistant recording data as the Botanist/Ecologist makes observations.
- 1) ___ Fill out all header information on all data forms and plant specimen labels during sampling.
- 2) ___ List floras used as nomenclatural sources (**Form V-1**) at the NWCA Site being sampled.
- 3) ___ Follow procedures in Section 5.1.4.2 for assigning pseudonyms for unknown plant species, and in Section 5.1.4.1 for assigning specimen tracking codes.
- 4) ___ Collect specimens for unknown plant species and five QA vouchers for known species as they are encountered or at the end of the sampling day (Section 5.1.4.1 and Section 5.2.1). Ensures all tracking information always remains with the specimens.
- 5) ___ Botanist Assistant compile a list of the scientific names or pseudonyms for shrub and tree species on his/her clipboard for use in collecting shrub height and tree count data (**Form V-4**).

*Major Data Collection Activities for each Veg Plot (Sections 5.1.4.2 – 5.1.4.8, **Reference Cards V-2, Side A and V-3**):*

- 1) ___ Make presence observations for all vascular species occurring within the two corner quadrat nests (Section 5.1.4.2, **Form V-2**).
- 2) ___ Identify, make cover estimates, and note the vertical stratum for all individual vascular plant species in each 100-m² Veg Plot (Section 5.1.4.4, **Form V-2**).
- 3) ___ Make cover estimates for vegetation strata (Section 5.1.4.5, **Form V-3a**).
- 4) ___ Make cover estimates and collect associated occurrence data for non-vascular taxonomic groups (Sections 5.1.4.6, **Form V-3a**).
- 5) ___ Collect data on ground surface attributes (Section 5.1.4.7, **Form V-3b**).
- 6) ___ Estimate and record heights for shrubs by species (Section 5.1.4.8, **Form V-4**).
- 7) ___ Count snags (> 5cm dbh) by estimated diameter class; count trees (> 5cm dbh) by species and estimated diameter class (Section 5.1.4.8, **Form V-4**).

Vegetation Stressors Across the AA:

- 8) ___ Make sure data on Vegetation Stressors and Disturbance (Chapter 3, **Form AA-3**) has been collected across the AA.

Field Day Wrap-Up Activities – At the Site:

- 1) ___ Complete collection of unknown and QA voucher specimens (Section 5.2.1).
- 2) ___ Review all Vegetation Data Forms:
 - a) ___ *Botanist/Ecologist* – Review **Forms V-2** and **V-4** for errors in species names and missing data. Make any needed corrections.
 - b) ___ *Botanist Assistant* – Review **Forms V-1** and **V-3** for missing data.
 - c) ___ *Veg Team* – If needed, return to Veg Plots of AA and collect any missing information.
- 3) ___ Collect and organize Veg equipment and samples for transport back to the vehicle.
- 4) ___ Botanist/Ecologist uses any time available after completion of vegetation sampling and plant specimen collection to key out unknown plant species. For unknowns confidently keyed to species, update pseudonyms to scientific names on **Forms V-2** and **V-4**.
- 5) ___ Botanist Assistant removes all flagging and markers, unless the site will receive a repeat sampling visit.
- 6) ___ If all Veg tasks at the AA are complete and AB Team is still working, assist them with their remaining work or return to the vehicle to begin pressing plants.
- 7) ___ Before leaving the AA make a final check to ensure no equipment, data, or samples are left behind. If leaving for the vehicle prior to the AB Team, carry selected AB Team equipment and samples to the vehicle.
- 8) ___ To prevent spread of potentially harmful organisms and invasive species between research sites; employ ZERO TAXA TRANSPORT protocols (Chapter 2). Decontaminate equipment, shoes, clothing and person as thoroughly as possible before leaving the site.

Field Day Wrap-Up Activities – At the Vehicle:

- 1) ___ Press plant specimens (see Section 5.2.2):
 - a) ___ Plant specimens are pressed at the vehicle whenever possible. If this is not feasible due to safety issues of parking location or weather, then plants may be pressed upon arrival at the field lodging location at the end of the day.
 - b) ___ Pressing specimens might be facilitated by forming an assembly line of all four crew members (Veg + AB Team). Be sure to include the *specimen tracking code* on the newsprint for each specimen and on the **Plant Specimen Label** included with each specimen (see Sections 5.2.3 and 5.2.4). As each specimen is pressed, record its specimen tracking information on the **Form V-5– Specimen Tracking Code**.
- 2) ___ Organize the completed forms into the data packet for the AA, and check to be sure there is an ample supply of vegetation data forms to be used at the next AA.
- 3) ___ If the vehicle is some distance from the AA, again decontaminate equipment, shoes, clothing and person at the vehicle to prevent spread of potentially harmful organisms and invasive species between research sites. Employ ZERO TAXA TRANSPORT protocols (Chapter 2).
- 4) ___ Return all vegetation equipment and supplies to their standard locations in the vehicle.

Plant Specimen Drying and Shipping (Sections 5.2.4 and 5.2.5):

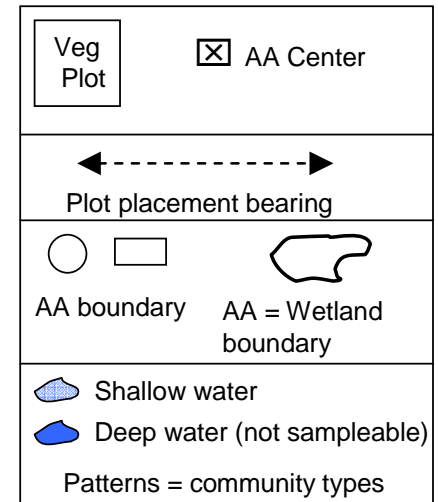
- 1) ___ Deliver the full presses to the home base where they can be completely dried (Section 5.2.4). Pick up empty presses for next field trip.
- 2) ___ Once plant specimens are dry, carefully pack them, being certain to include tracking labels and forms, then ship to designated herbarium/herbaria.
- 3) ___ If Botanist/Ecologist is involved during non-field days or post-field season in plant specimen identification and data form or spreadsheet update with correcting pseudonyms to scientific names, follow the procedures outlined in the NWCA-FOM.

Reference Card V-1, Side A. Rules for Veg Plot Placement and Examples of Plot Layout Configurations

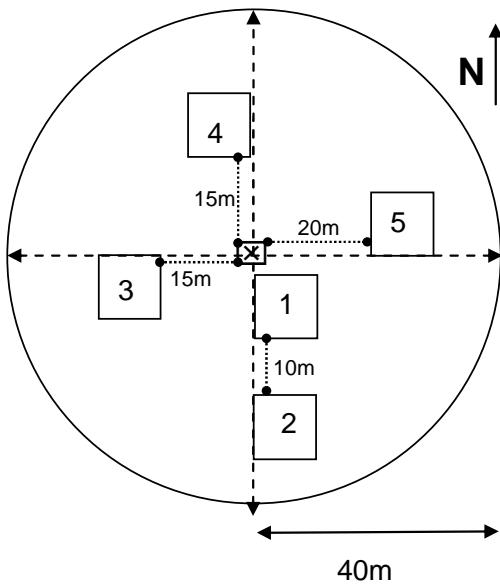
Rules for Veg Plot Placement within the Assessment Area (AA)

- 1a** AA is $\frac{1}{2}$ ha in area **2**
2a AA is a circle *Standard Veg Plot Layout*
2b AA is a rectangle (wetland dimension is < 80m in at least one direction) **3**
3a AA has width and length > 30m *Alternate Veg Plot Layout 1*
3b AA is ≤ 30 m wide *Alternate Veg Plot Layout 2*
- 1b** AA < $\frac{1}{2}$ ha, but > 0.1ha; a polygon equaling wetland boundary *Alternate Veg Plot Layout 3*
- 1c** Obstacles prevent placement of plots in designated locations in AA (deep water; wide, deep channels; cliffs, other physical barriers, etc.) *Obstacle Veg Plot Layout*

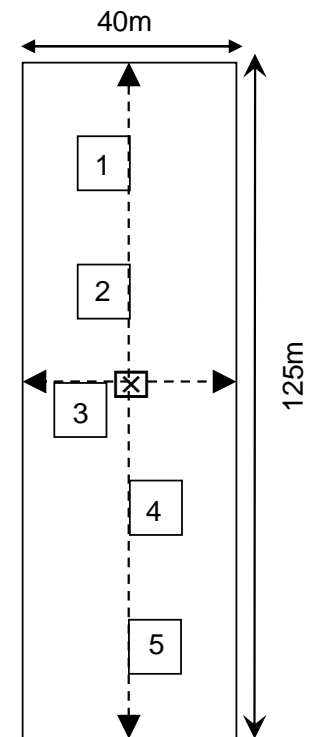
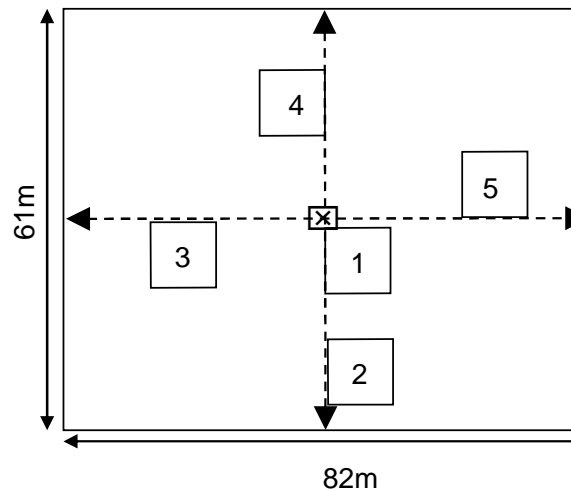
Examples (scales vary) of Veg Plot Layout Configurations – below and next page



Standard Veg Plot Layout –
AA $\frac{1}{2}$ hectare circle

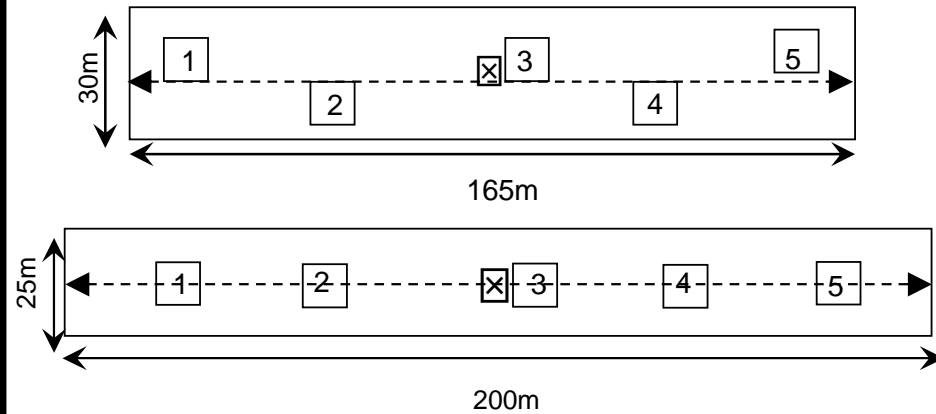


Alternate Veg Plot Layout 1
AA $\frac{1}{2}$ hectare rectangle,
width and length > 30m



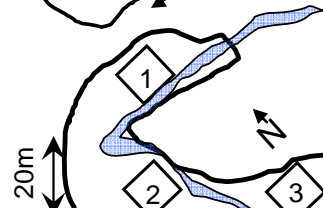
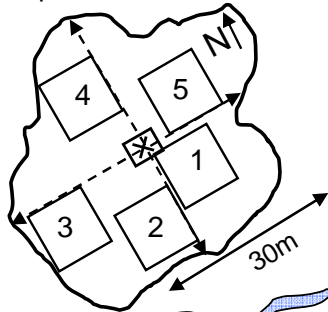
Reference Card V-1, Side B. Examples of Plot Layout Configurations *continued*

Alternate Veg Plot Layout 2 – AA is a ½ ha rectangle ≤ 30 wide

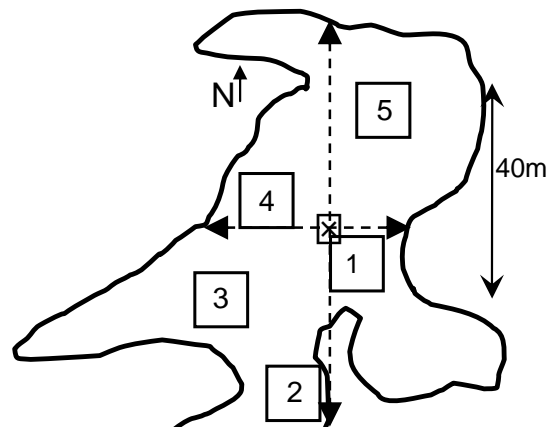


Alternate Veg Plot Layout 3 – AA (0.1ha to < 0.5ha) = wetland boundary

Example AA ≈ 0.14ha

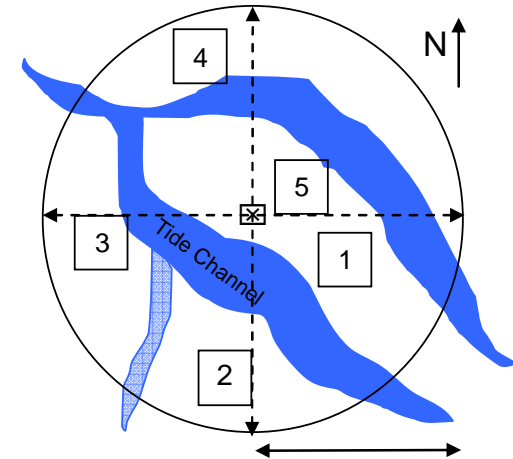


Example AA ≈ 0.22ha

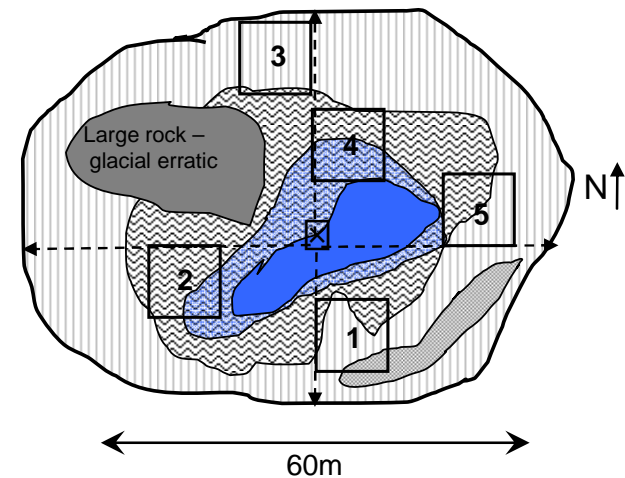


Example AA ≈ 0.20ha

Obstacle Veg Plot Layout

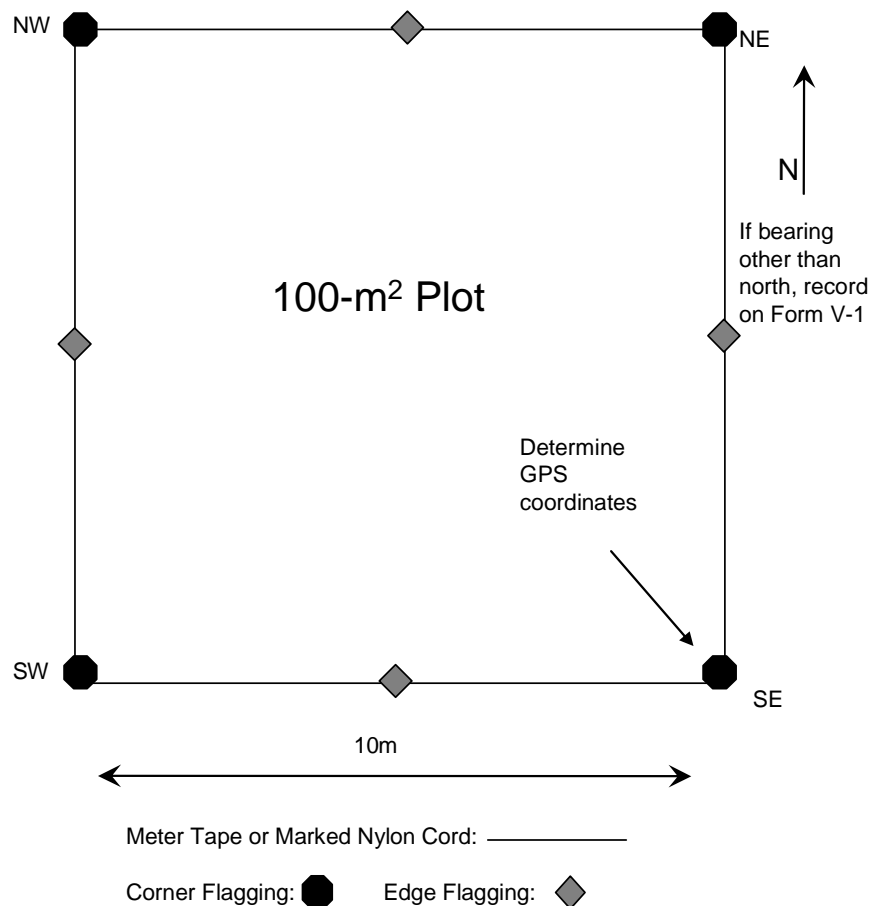


Example AA – 0.5ha 40m



Example AA ≈ 0.4ha

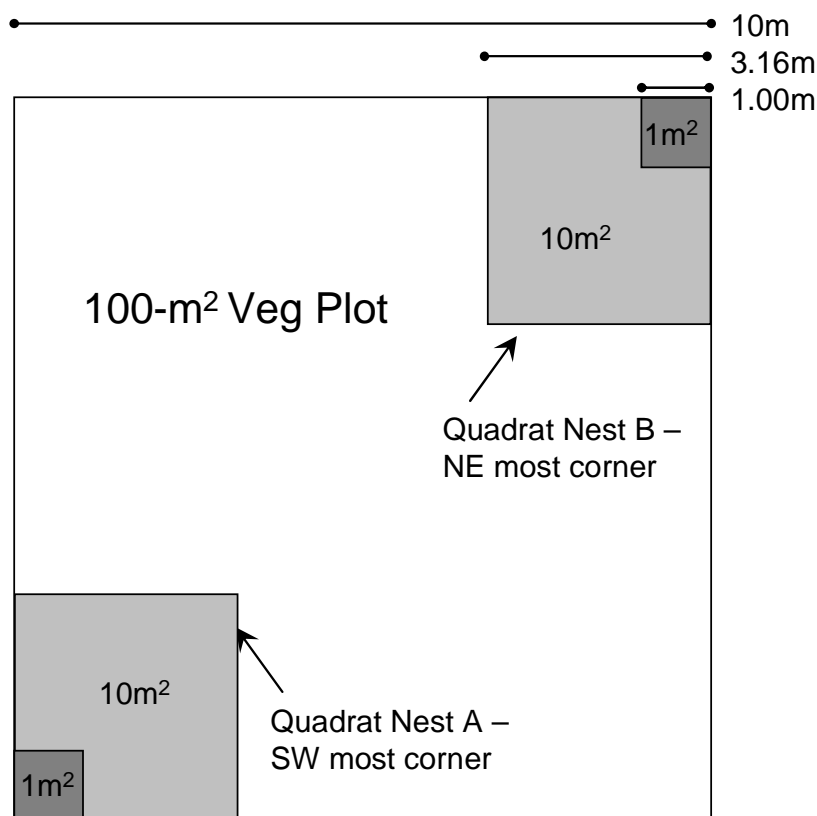
Reference Card V-2. Side A – Vegetation Plot Establishment



Setting up the Veg Plot

1. Record the GPS coordinates (decimal degrees of latitude and longitude) for the SE most corner of the each plot in the *GPS Coordinates* section of **Form V-1**.
2. Demarcate the outside edges of each Veg Plot with meter tapes or marked durable (e.g., nylon) ropes or cords. Pin these lines in place using tent stakes, U-shaped pins, or surveyor's pins. Mark corners and mid-points of each side of the plot with different colored flagging or pin flags, e.g., fluorescent pink or red for corners, blue for mid-points of the plot edges.
3. Place a pin flag (e.g., red) at one corner of the Veg Plot, and stretch the meter tape or marked cord 5m along the appropriate compass bearing and place an edge pin flag (e.g., blue).
4. Continue 5m to the second corner of the plot and place another corner pin flag.
5. At the second corner make a 90 degree turn and follow the compass bearing to the third corner. Stretch the tape or marked cord 5m, place an edge pin flag, continue 5m to the third corner and place a corner pin flag.
6. Continue this procedure once more from the third to the fourth corner.
7. For situations with shallow standing water, the tape or marked cord may be anchored at the corners and allowed to float on the water surface.
8. If the vegetation is too dense with shrubs or trees to lay the tape or marked cord in a straight line, use pin flags or other flagging at the corners and 5m marks along each edge of the plot and tie additional flagging to shrubs and trees at intervals so that the outline of the plot is clearly visible.
8. When stretching tapes or lines along a compass bearing, there will occasionally be some drift related to obstacles and slope, so the plot edges may not be perfectly straight. Some drift is acceptable, but try to keep the Veg Plot relatively square and constant in area.

Reference Card V-2. Side B – Veg Plot Configuration and Data Collection Summary.



Establishing Quadrat Nests:

___ *Outside edges of quadrats:* Formed by the meter tape or marked cords defining boundary of the 100-m² Veg Plot

___ *Inside edges of 10-m² quadrat:* two 3.16 m PVC poles with decimeter points marked in red (poles may break down to shorter lengths for easy of carrying)

___ *Inside edges of 1-m² quadrat frame:* two 1m PVC poles with decimeter points marked in red, poles can be joined with an elbow joint in the field

Species Presence Data in 1-m² and 10-m² quadrats

1. Collect species presence data in nested quadrats (1-m² and 10-m² at SW (Nest A) and NE (Nest B) most Veg Plot corners) of 100-m² Veg Plot.
2. For each species present in the SW or NE Nest, record the smallest quadrat in which it occurs (1-m² or 10-m²) on **Form V-2**.

Data to Collect in 100-m² Veg Plot

1. *Individual vascular plant species* – Estimate cover for each species and record the primary stratum in which it occurs; **Form V-2**. For tree species, only, if a tree species occurs in multiple strata, estimate its cover for each stratum in which it occurs (e.g., ground layer, shrub layer, tree layer).
2. *Vertical strata* – Estimate total cover of each vertical stratum (canopy tree, tree, tall shrub, shrub, ground/herb, submerged aquatic vegetation, and floating aquatic vegetation layers); **Form V-3a**.
3. Estimate cover of *non-vascular groups* (bryophytes, ground lichens, and macroalgae); **Form V-3a**.
4. Collect data for *ground surface attributes*; **Form V-3b**
5. *Shrubs* – Estimate average height of clumps or patches for each species; **Form V-4**
6. *Trees* – Count stems for individuals > 5 cm diameter breast height (dbh) by diameter class (5-10, 10-25, 26-50, 51-75, 76-100, and > 100 cm) by species; **Form V-4**.
7. *Standing dead trees and snags* - Count total number of stems > 5 cm dbh by diameter class (5-10, 10-25, 26-50, 51-75, 76-100, and > 100 cm); **Form V-4**.

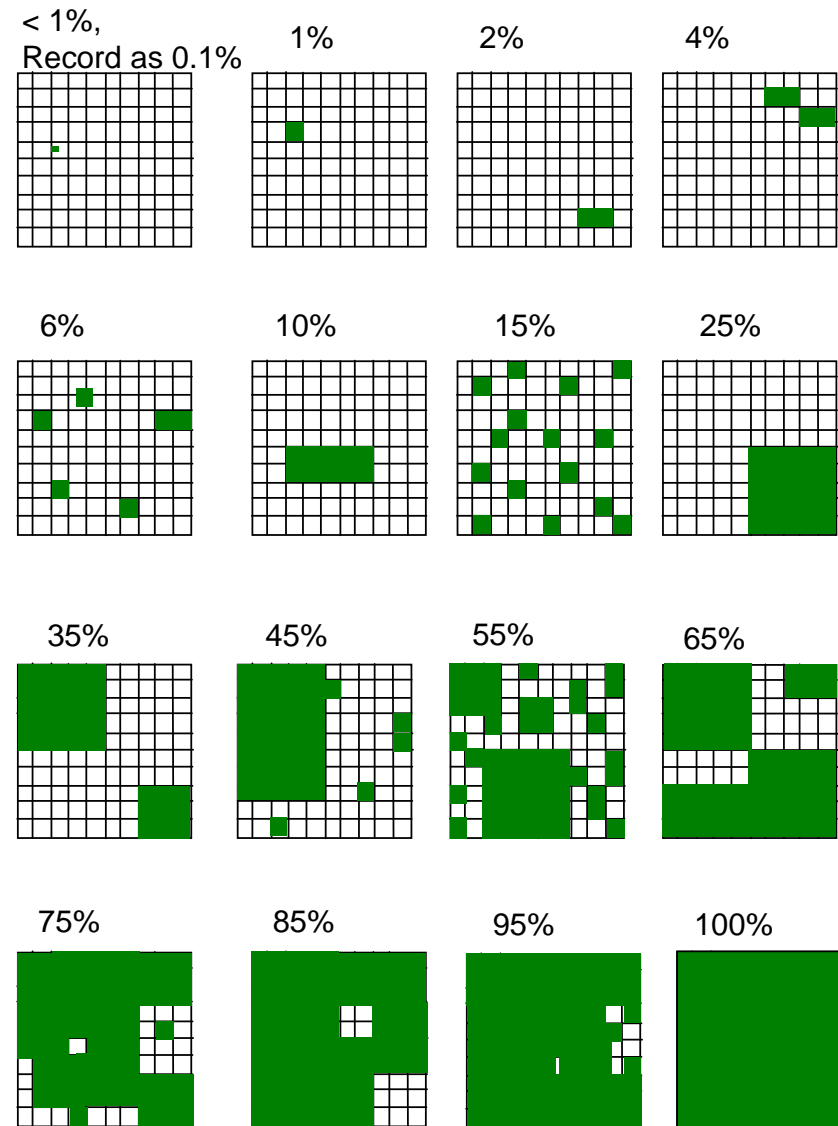
Plant Specimen Collection and Tracking

1. Collect unknown species
2. Randomly select and collect QA specimens
3. Complete specimen labels, press plants, and record plant specimen tracking information on **Form V-5**.

Reference Card V-3. Cover Estimation Procedures

Estimating Cover in 100 m² Veg Plots

1. Cover estimates for various entities (individual plant species, vegetation strata, non-vascular taxonomic groups, and ground surface attributes) are made in all five 100-m² Veg Plots in an AA.
2. See Sections 5.1.4.3 - 5.1.4.7 of the *NWCA Field Operations Manual* for detailed cover estimation procedures. Cover data are recorded on Forms V-2a and b and V-3a and b.
3. Cover determinations for a particular entity of interest (species, taxonomic group, or vegetation stratum) are made by estimating the percentage of ground space in a 100-m² Veg Plot overlain by the canopies of all individuals or patches of that entity.
4. Cover values may range from 0 to 100% for a particular individual species or entity. Because species, vegetation strata, or taxonomic groups may overlie one another vertically, the combined cover for different species or entities may often exceed 100%.
5. Estimate cover directly as the percentage (0 to 100%) of the plot area covered by the species or vegetation group under consideration. Cover may be estimated in 1% increments, however, *do not deliberate excessively over values for cover estimates*. For values < 1%, record 0.1%.
6. The figure to the right illustrates some examples of different levels of percent cover across 100-m² Veg Plots.



Examples of Percent Cover Estimates. Each large square = a 100 m² Veg Plot, grid squares = 1 m² = 1% cover in a Veg Plot, shaded areas represent cover of an individual species, a vegetation stratum, or of a non-vascular species group.

Placeholder for **Reference Card V-3, Side B**: Pseudonym Assignment, and Plant Specimen Collection, Drying and Shipping

5.4 EQUIPMENT LIST, DATA FORMS, SPECIMEN LABELS

The equipment lists, data forms, specimen labels, and vegetation checklist needed for Vegetation sampling are summarized in the table below. Individual forms are presented on the pages following this table.

<i>Vegetation Data Form, Check Lists, and Labels</i>	Number Needed Per AA
Vegetation Equipment and Supply Checklist	1 checklist
Form V-1 – Vegetation Plot Establishment	1 form
Form V-2 (a and b) – Species Presence and Cover	5 sets of forms - 1 set per Veg Plot (number of V-2b pages for a given plot depends on number of species present)
Form V-3 (a and b)– Vegetation Types and Ground Surface Attributes	1 form
Form V-4 (a and b) Shrub Heights, Snag and Tree Counts	5 set of forms – 1 set per Veg Plot (number of V-4b pages depends on number of tree species)
Form V-5 – Plant Specimen Tracking	1 form
Plant SpecimenTracking Tag	Small tag included in the collection bag for an individual plant specimen, number/AA varies based on number of specimens collected
Plant Specimen Label	1 form per plant specimen, number/AA varies based on number of specimens collected
Plant Shipping Label	1 label
Checklist of Vegetation Sampling Tasks	1 checklist

Note that the forms presented in this section are draft versions. The Information Management Team is working refining the forms for ease of use in the field and to make them scannable for data entry.

VEGETATION EQUIPMENT AND SUPPLY CHECKLIST

Protocols, forms, checklists, supplies

- ___ This equipment checklist
- ___ Vegetation protocol checklist
- ___ Reference Cards V-1, V-2 and V
- ___ Available plant species lists pertinent to the site and/or regions (wetland species, alien species, threatened and endangered species)
- ___ Data Forms on waterproof paper: (see Section 5.4 for number of each needed)
 - ___ **Form V-1** – Vegetation Plot Establishment
 - ___ **Form V-2a** and **V-2b** – Species Presence and Cover
 - ___ **Form V-3a** and **V-3b** – Vegetation Types and Ground Surface Attributes
 - ___ **Form V-4a** and **V-4b** – Shrub Heights, Snag and Tree Counts
 - ___ **Form V-5** – Plant Specimen Tracking
- ___ Waterproof field notebook
- ___ 2 covered clip boards, with storage for completed forms
- ___ Sharpies, regular pencils, mechanical pencils, extra leads

Plant identification in the field or vehicle

- ___ Regional floras
- ___ 2 10X hand lenses
- ___ Dissecting tools (e.g., single edge razor blades, forceps, and dissecting needles)
- ___ 6 cm ruler for measuring plant parts during field keying

Plot establishment and data collection

- ___ 1 set of 2-way radios
- ___ Compass
- ___ GPS unit
- ___ Laser rangefinder
- ___ Reflector for sighting rangefinder on
- ___ Diameter measuring tape (cm) to calibrate investigators to make dbh estimates for trees (carry until calibrated, then leave in vehicle)
- ___ Four 50m tapes⁴ and/or eight 20m or sixteen 10m lengths of strong, durable cord/rope⁵
- ___ 30 tent stakes, U-shaped pins, or surveyors' pins for securing meter tapes and/or ropes

⁴ Carry at least one tape in case conditions limit use of GPS, range finder.

⁵ Durable cord (e.g., nylon)/rope in 10 or 20m lengths – with 5m points with blue tape, 10m points with red tape. Add equipment list, overview of plot establishment steps

Plot establishment and data collection *continued*

- ___ 40 to 50 pin flags (recommend two bright colors with 1/2 of pins in each color) and pouch for carrying
- ___ Bright colored flagging in 2 colors
- ___ **Inside edges of 10-m² quadrat**: two 3.16 m PVC poles with decimeter points marked in red⁶ (poles may break down to two shorter lengths for easy of carrying, one segment/pole = 1m)
- ___ **Inside edges of 1-m² quadrat frame**: two 1m PVC poles (1m lengths from 3.16m segment pole) that can be connected with an elbow joint in the field

Plant specimen collection, processing, and shipping

- ___ Trowel for obtaining plant specimens with intact roots
- ___ Clippers/pruners
- ___ Twist-tie tags or flagging for marking unknown species that may be carried in small 'bouquets' for reference during sampling
- ___ Gallon size zip-loc plastic bags and kitchen size white trash bags for collecting individual plant specimens
- ___ White garbage bag for consolidating collection bags
- ___ Ice chest (kept in vehicle)
- ___ At least 2 large plant presses loaded with blotters, ventilators, and newsprint, compression straps, small envelopes for loose plant parts (kept in vehicle)
- ___ At least 2 extra complete plant presses (kept at base location to exchange for full presses)
- ___ **Plant Specimen Tracking Tags** (Section 5.4)
- ___ **Plant Specimen Labels** (Section 5.4)
- ___ Plant specimen folders and shipping boxes for shipping plant specimens to herbaria for identification

⁶ PVC poles with decimeter marks can also be used as measuring sticks

Site ID: NWCA11-____ State: ____

Veg Team ID _____

Sampling Date: ____/____/2011 Reviewed By:____

Botanist/Ecologist_____

Botanist Assistant_____

Vegetation Plot Layout - Check one (see Reference Card V-1 for descriptions of plot layout configurations):☐ **Standard Veg Plot Layout** (AA is a ½ ha circle)☐ **Alternate Veg Plot Layout 1** (AA is a ½ ha rectangle, width and length > 30m)☐ **Alternate Veg Plot Layout 2** (AA is a ½ ha rectangle ≤ 30 m wide)☐ **Alternate Veg Plot Layout 3** (AA < ½ ha; a polygon equal to wetland boundary)☐ **Obstacle Veg Plot Layout** (Obstacles prevent placement of plots in systematic designated locations. Describe obstacles in notes.)**Plot Placement Bearings – Check one; if Other, record short and long axis bearings:**☐ Cardinal directions (N, S, E, W) – Standard AA or AA with similar length and width☐ Other – AA is a rectangle or polygon with length much greater than width:

Long axis bearing _____ Short axis bearing _____

GPS Coordinates (NAD 83, decimal degrees) for the SE corner of the plot. *If plot placement bearings are other than cardinal directions, then note the bearing from SE most to NE most corner for each plot.

Plot	Latitude North	Longitude West	Bearing*
Plot 1	_____ . _____	_____ . _____	
Plot 2	_____ . _____	_____ . _____	
Plot 3	_____ . _____	_____ . _____	
Plot 4	_____ . _____	_____ . _____	
Plot 5	_____ . _____	_____ . _____	

Primary Flora:**Additional Flora/Field Guide:**

Add the locations of the Veg Plots to the aerial photo annotated during AA establishment, or if no photo is available to AA sketch map or Establishment Form (AA-1). Number Veg Plots 1 through 5 using guidelines on Reference Card V-1. If appropriate, note nature and direction of environmental gradients, water bodies, and major vegetation patches.

Site ID: NWCA11-____

Sampling Date: ____/____/2011

Notes (If needed elaborate on reasons for plot layout selection and make notes about unique features of vegetation or environment):

[illegible]

Site ID: NWCA11-____ State: ____

Veg Team ID _____

Sampling Date: ____/____/2011 Reviewed by: _____

Botanist/Ecologist _____

Botanist Assistant _____

Instructions:

- Header Information:** Fill out all header information. Be sure to include plot number.
- Rows represent data for each individual plant species occurring in a plot.
- Species Name:** List binomial names or pseudonym for each plant species observed in the plot (Pseudonym rules on Reference Card V-3b).
- Stratum:** Record the primary vegetation stratum in which each species occurs by filling in the appropriate vegetation stratum box. For **tree species only** that occur in multiple strata, repeat the species name on the data form and estimate its cover in each stratum in which it occurs.
- Presence Data:** For each species in a *quadrat nest* (SW or NE), fill-in the smallest quadrat size (1-m² or 10-m²) in which the species occurs.
- Cover Data:** Estimate cover for each species (0 to 100%) observed for the entire 100-m² plot and record this value in the *Cover* data field. If necessary, make preliminary estimates of the cover for each species in each of the four quarters of the plot, recording the preliminary values in the appropriate *Workspace* field. Combine preliminary estimates to obtain total cover for the species in the plot and record in the *Cover* data field.
- Collect Specimens:** For each unknown species or QA specimen to be collected fill-in top box in the *Collect* column, once collected fill-in bottom box. If the specimen is a quality assurance specimen, fill in the box in the QA column.

QA	Collect	Stratum (fill one)	Species Name or Pseudonym	SW Nest	NE Nest	Cover	Workspace
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		

CT - Canopy Tree - Tallest canopy trees, upper tree layer formed by mature tree crowns; **T- Mid-Canopy Tree** -Typically > 4m; mid-canopy trees not reaching the upper canopy; **S - Tall Shrub** - ~2 to 4m; tall shrubs, tree saplings; **LS - Low Shrub** - 0.5-2.0m woody; medium shrubs, tree seedlings; **G - Ground** - all herbaceous species (except aquatic) regardless of height, shrubs and tree seedlings < 0.5m; **SA - Submerged Aquatic** - Submerged aquatic vegetation (rooted in the sediment, most of plant cover is submerged or floating on water); **FA - Floating Aquatic** - Floating aquatic vegetation (not rooted in sediment); **LE - Lianas and epiphytes**

FORM V-2b – SPECIES PRESENCE AND COVER
PLOT NUMBER _____ **Page** ____ **of** ____

Site ID: NWCA11-_____ Veg Team ID_____ Sampling Date: _____/_____/2011

QA	Collect	Stratum (fill one)	Species Name or Pseudonym	SW Nest	NE Nest	Cover	Workspace
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	CT <input type="checkbox"/> , T <input type="checkbox"/> , S <input type="checkbox"/> , LS <input type="checkbox"/> , G <input type="checkbox"/> , SA <input type="checkbox"/> , FA <input type="checkbox"/> , LE <input type="checkbox"/>		1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>		

FORM V-3a – VEGEGETATION TYPES

Site ID Number: NWCA11-____ State: _____

Sampling Date: ____/____/2011 Reviewed By: _____
(month) (day)

Veg Team ID: _____

Botanist/Ecologist _____

Botanist Assistant _____

- Instructions:**
1. Fill out header all information on both sides of Form.
 2. Estimate the cover for each *Vertical Vegetation Stratum*.
 3. Estimate cover of *Non-Vascular Taxonomic Groups*. For macroalgae note whether the algae is predominantly living, wrack, or status is unknown.
 4. Cover for **each** Stratum or each Non-Vascular Group can range from 0 to 100%

Notes:

% Cover Vertical Vegetation Strata	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
CT - Canopy Tree: Tallest canopy trees, upper tree layer formed by mature tree crowns					
T - Mid-Canopy Tree: Typically > 4m; mid-canopy trees not reaching the upper canopy					
S - Tall Shrub: ~2 to 4m; tall shrubs, tree saplings					
LS - Low Shrub: 0.5-2.0m woody; medium shrubs, tree seedlings					
G - Ground/Herb: All herbaceous species (except aquatic) regardless of height, shrubs and tree seedlings < 0.5m, non-vascular species in the ground layer					
SA - Submerged Aquatic: Submerged aquatic vegetation (rooted in sediment, most plant cover submerged or floating on water)					
FA - Floating Aquatic: Floating aquatic vegetation (not rooted in sediment)					
LE – Lianas and epiphytes: Lianas and epiphytes (including bryophytes and lichens) in any vertical stratum					
%Cover Non-Vascular Taxa	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
Bryophytes (mosses and liverworts) Cover					
Fill-in box if <i>Sphagnum</i> or other peat-forming mosses dominate bryophytes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lichens growing on ground surfaces, logs, rocks, etc.					
Filamentous or Mat Forming Algae Cover					
Macroalgae Cover (freshwater species/seaweeds):					
When Macroalgae is present, fill in all boxes that apply for each Veg Plot:					
Wrack (detached, debris, stranded)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Attached/living	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unknown status	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

FORM V-3b – GROUND SURFACE ATTRIBUTES

Site ID Number: NWCA11-____ ____ ____ ____ Veg Team:____ Sampling Date: ____ ____/____ ____/2011

Instructions: Estimate the percent of Veg Plot area covered by ground surface attributes. Coarse and fine woody debris may each range from 0 to 100 %. Measure litter or water depth with marked 1m PVC pole or ruler.

Water	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
Percent of Veg Plot area with water and no vegetation					
Percent of Veg Plot area with water and floating, submerged aquatic vegetation					
Percent of Veg Plot area with water and emergent vegetation					
Record water depth in cm from 3 locations representing range of water levels in plot	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
Shallow (cm)					
Moderate (cm)					
Deepest (cm)					
Cover Bareground	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
Exposed soil/sediment					
Exposed gravel/cobble (~2mm to 25cm)					
Exposed rock (>25cm)					
Vegetative Litter	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
Cover Vegetative Litter					
Predominant Litter type(s) (fill-in all that apply): T = thatch (dead graminoid (e.g., grasses, sedges, rushes) leaves, rhizomes, or other material) F = forb C = coniferous tree E = broadleaf evergreen tree D = deciduous tree M = mixed	T <input type="checkbox"/> F <input type="checkbox"/> C <input type="checkbox"/> E <input type="checkbox"/> D <input type="checkbox"/> M <input type="checkbox"/>	T <input type="checkbox"/> F <input type="checkbox"/> C <input type="checkbox"/> E <input type="checkbox"/> D <input type="checkbox"/> M <input type="checkbox"/>	T <input type="checkbox"/> F <input type="checkbox"/> C <input type="checkbox"/> E <input type="checkbox"/> D <input type="checkbox"/> M <input type="checkbox"/>	T <input type="checkbox"/> F <input type="checkbox"/> C <input type="checkbox"/> E <input type="checkbox"/> D <input type="checkbox"/> M <input type="checkbox"/>	T <input type="checkbox"/> F <input type="checkbox"/> C <input type="checkbox"/> E <input type="checkbox"/> D <input type="checkbox"/> M <input type="checkbox"/>
Depth of Litter (cm) in SW most corner of Veg Plot					
Depth of Litter (cm) in NE most corner of Veg Plot					
Woody Debris	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
Cover coarse woody debris (standing dead trees, shrubs, fallen trees, rotting roots)					
Cover fine wood debris (< 5cm diameter)					

SHRUB HEIGHTS, SNAG AND TREE COUNTS FORM (V-4a)						PLOT NUMBER _____ Page 1 of _____								
Site ID: NWCA11-____ State: ____ Reviewed By: ____ Sampling Date: ____/____/2011 Veg Team ID: ____ Botanist/Ecologist _____ Botanist Assistant _____						Shrub Species Name or Pseudonym				Shrub Height (m)				
Shrubs, Trees, or Snags Absent (fill-in all that apply): <input type="checkbox"/> No shrubs <input type="checkbox"/> No live trees <input type="checkbox"/> No dead trees/snags														
Instructions for Recording Data: 1. <i>Species Names or Pseudonyms for Trees and Shrubs:</i> Record the names or pseudonyms of each individual shrub and tree species. If a pseudonym is used be sure to use the same name as used on Form V-2 for this Veg Plot. 2. <i>Mean Shrub Height:</i> For each shrub species in the Veg Plot, measure or estimate the height in meters (e.g., 1.4m) of several representative individuals or patches. Record the mean height by species in the "Shrub Height" column. 3. <i>Standing Dead Trees and Snags:</i> Use the gray workspace columns, if needed, for each diameter class to tally* snags for that class. Record the total number of snags for each diameter class in the white data column. 4. <i>Live Trees:</i> Count trees > 5 cm in the Veg Plot by species in DBH classes. For each species, a running tally* of numbers of trees in each DBH class can be recorded in gray shaded workspace in the DBH class columns. Once all the trees are tallied, record the total number for each species in each DBH class in the white data field for each DBH column.														
Snags and Live Trees			Tree Counts by DBH Class											
			5 to 10cm		11 to 25cm		26 to 50cm		51 to 75 cm		76 to 100cm		>100cm	
Dead trees/Snags→														
Trees Species Name or Pseudonym↓														
*Tally Format:			<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin: 0 5px;">●¹</div> <div style="border: 1px solid black; padding: 2px; margin: 0 5px;">● ●²</div> <div style="border: 1px solid black; padding: 2px; margin: 0 5px;">● ● ●³</div> <div style="border: 1px solid black; padding: 2px; margin: 0 5px;">● ● ● ●⁴</div> <div style="border: 1px solid black; padding: 2px; margin: 0 5px;">— —⁵</div> <div style="border: 1px solid black; padding: 2px; margin: 0 5px;">— —⁶</div> <div style="border: 1px solid black; padding: 2px; margin: 0 5px;">— —⁷</div> <div style="border: 1px solid black; padding: 2px; margin: 0 5px;">— —⁸</div> <div style="border: 1px solid black; padding: 2px; margin: 0 5px;">— —⁹</div> <div style="border: 1px solid black; padding: 2px; margin: 0 5px;">— —¹⁰</div> </div>											

SHRUB HEIGHTS, SNAG AND TREE COUNTS FORM (V-4b) PLOT NUMBER _____ Page 2 of ____

PLOT NUMBER _____ Page 2 of _____

Site ID: NWCA11-_____ Veg Team ID _____

Veg Team ID _____

Sampling Date: ____/____/2011

[illegible]

Page 1 of

Veg Team ID _____

Botanist/Ecologist

Botanist Assistant

1. Record the Site ID number, plot number, and pseudonym for each plant specimen.
2. Plot number is recorded by filling in the appropriate square.
3. Ensure that pseudonyms or species names recorded match those provided on Form V-2.
4. If the specimen is a quality assurance species of known identity, fill-in the box in the QA column.
5. One copy of this form stays in the data packet that goes to the Information Management Team. A xeroxed copy of the form accompanies the specimens for each AA when they are sent to the herbarium for identification.

[illegible]

FORM V-5 – PLANT SPECIMEN TRACKING

Page ____ of ____

Site ID: NWCA11-____ Sampling Date: ____/____ 2011 Veg Team ID _____
 (month) (day)

[illegible]

PLANT SPECIMEN LABEL	
Site ID Number: NWCA11-____ _	Collection Date: ____/____/2011 (month) (day)
Specimen Tracking Code:	Collector(s) Name(s):
GPS coordinates for this site are in the Site Packet and for Veg Plots on Form V-1 . County, State, and associated species will be included in the NWCA database.	
Field Data:	
Pseudonym for unknown specimen:	○ - If QA specimen fill in circle QA specimen Scientific Name:
Habitat Description: Wetland Type for this site is available on Form AA-2 . Describe setting, any notable disturbances.	
Plant Habit:	
Frequency/Cover: <input type="checkbox"/> Dominant, <input type="checkbox"/> Common, <input type="checkbox"/> Sparse, <input type="checkbox"/> A few plants	
Herbarium Data:	
Scientific Name:	Identified By/Verified By:

PLOT NUMBER 4 Page 1 of 1

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FORM V-2a – SPECIES PRESENCE AND COVER				PLOT NUMBER <u>4</u>		Page 1 of <u>4</u>	
Site ID: NWCA11- <u>1 5 1 6</u> State: <u>OR</u>				Veg Team ID <u>LG-JP</u>			
Sampling Date: <u>0 7 1 0 8</u> /2011 Reviewed by: <u>AZ</u>				Botanist/Ecologist <u>Lily Glacier</u>			
				Botanist Assistant <u>Jeff Park</u>			
Instructions: 1. Header Information: Fill out all header information. Be sure to include plot number. 2. Rows represent data for each individual plant species occurring in a plot. 3. Species Name: List binomial names or pseudonym for each plant species observed in the plot (Pseudonym rules on Reference Card V-3b). 4. Stratum: Record the primary vegetation stratum in which each species occurs by filling in the appropriate vegetation stratum* box. For tree species only that occur in multiple strata, repeat the species name on the data form and estimate its cover in each stratum in which it occurs. 5. Presence Data: For each species in a <i>quadrat nest</i> (SW or NE), fill-in the smallest quadrat size (1-m ² or 10-m ²) in which the species occurs. 7. Cover Data: Estimate cover for each species (0 to 100%) observed for the entire 100-m ² plot and record this value in the <i>Cover</i> data field. If necessary, make preliminary estimates of the cover for each species in each of the four quarters of the plot, recording the preliminary values in the appropriate <i>Workspace</i> field. Combine preliminary estimates to obtain total cover for the species in the plot and record in the <i>Cover</i> data field. 8. Collect Specimens: For each unknown species or QA specimen to be collected fill-in top box in the <i>Collect</i> column, once collected fill-in bottom box. If the specimen is a quality assurance specimen, fill in the box in the QA column.							
QA	Collect	Stratum (fill one)	Species Name or Pseudonym	SW Nest	NE Nest	Cover	Workspace
<input type="checkbox"/>	<input type="checkbox"/>	CT <input type="checkbox"/> T <input type="checkbox"/> S <input type="checkbox"/> LS <input type="checkbox"/> G <input type="checkbox"/> SA <input type="checkbox"/> FA <input type="checkbox"/> LE <input type="checkbox"/>	<i>Kalmia microphylla</i>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	17	5 5 7
<input type="checkbox"/>	<input type="checkbox"/>	CT <input type="checkbox"/> T <input type="checkbox"/> S <input type="checkbox"/> LS <input type="checkbox"/> G <input type="checkbox"/> SA <input type="checkbox"/> FA <input type="checkbox"/> LE <input type="checkbox"/>	<i>Carex1 - tussock</i>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	45	15 5 25
<input type="checkbox"/>	<input type="checkbox"/>	CT <input type="checkbox"/> T <input type="checkbox"/> S <input type="checkbox"/> LS <input type="checkbox"/> G <input type="checkbox"/> SA <input type="checkbox"/> FA <input type="checkbox"/> LE <input type="checkbox"/>	<i>Carex2 - 3stigmatas</i>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	3	3
<input type="checkbox"/>	<input type="checkbox"/>	CT <input type="checkbox"/> T <input type="checkbox"/> S <input type="checkbox"/> LS <input type="checkbox"/> G <input type="checkbox"/> SA <input type="checkbox"/> FA <input type="checkbox"/> LE <input type="checkbox"/>	<i>Picea engelmannii</i>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	18	9 9
<input type="checkbox"/>	<input type="checkbox"/>	CT <input type="checkbox"/> T <input type="checkbox"/> S <input type="checkbox"/> LS <input type="checkbox"/> G <input type="checkbox"/> SA <input type="checkbox"/> FA <input type="checkbox"/> LE <input type="checkbox"/>	<i>Picea engelmannii</i>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	20	3 17
<input type="checkbox"/>	<input type="checkbox"/>	CT <input type="checkbox"/> T <input type="checkbox"/> S <input type="checkbox"/> LS <input type="checkbox"/> G <input type="checkbox"/> SA <input type="checkbox"/> FA <input type="checkbox"/> LE <input type="checkbox"/>	<i>Vaccinium occidentale</i>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	34	3 15 7 9
<input type="checkbox"/>	<input type="checkbox"/>	CT <input type="checkbox"/> T <input type="checkbox"/> S <input type="checkbox"/> LS <input type="checkbox"/> G <input type="checkbox"/> SA <input type="checkbox"/> FA <input type="checkbox"/> LE <input type="checkbox"/>	<i>Drosera rotundifolia</i>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	4	1 1 2
<input type="checkbox"/>	<input type="checkbox"/>	CT <input type="checkbox"/> T <input type="checkbox"/> S <input type="checkbox"/> LS <input type="checkbox"/> G <input type="checkbox"/> SA <input type="checkbox"/> FA <input type="checkbox"/> LE <input type="checkbox"/>	<i>Polygonum bistortoides</i>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	13	3 2 5 3
<input type="checkbox"/>	<input type="checkbox"/>	CT <input type="checkbox"/> T <input type="checkbox"/> S <input type="checkbox"/> LS <input type="checkbox"/> G <input type="checkbox"/> SA <input type="checkbox"/> FA <input type="checkbox"/> LE <input type="checkbox"/>	<i>Habenaria dilatata</i>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1	1 0.1 0.1
<input type="checkbox"/>	<input type="checkbox"/>	CT <input type="checkbox"/> T <input type="checkbox"/> S <input type="checkbox"/> LS <input type="checkbox"/> G <input type="checkbox"/> SA <input type="checkbox"/> FA <input type="checkbox"/> LE <input type="checkbox"/>	<i>Salix1 - tall, yellowish twig</i>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	29	5 20 4
<input type="checkbox"/>	<input type="checkbox"/>	CT <input type="checkbox"/> T <input type="checkbox"/> S <input type="checkbox"/> LS <input type="checkbox"/> G <input type="checkbox"/> SA <input type="checkbox"/> FA <input type="checkbox"/> LE <input type="checkbox"/>	<i>Mimulus primulaoides</i>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	6	3 2 1
<input type="checkbox"/>	<input type="checkbox"/>	CT <input type="checkbox"/> T <input type="checkbox"/> S <input type="checkbox"/> LS <input type="checkbox"/> G <input type="checkbox"/> SA <input type="checkbox"/> FA <input type="checkbox"/> LE <input type="checkbox"/>	<i>Dodecatheon jefferyii</i>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	14	5 5 7
<input type="checkbox"/>	<input type="checkbox"/>	CT <input type="checkbox"/> T <input type="checkbox"/> S <input type="checkbox"/> LS <input type="checkbox"/> G <input type="checkbox"/> SA <input type="checkbox"/> FA <input type="checkbox"/> LE <input type="checkbox"/>	<i>Populus tremuloides</i>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	15	15
<input type="checkbox"/>	<input type="checkbox"/>	CT <input type="checkbox"/> T <input type="checkbox"/> S <input type="checkbox"/> LS <input type="checkbox"/> G <input type="checkbox"/> SA <input type="checkbox"/> FA <input type="checkbox"/> LE <input type="checkbox"/>	<i>Ledum groenlandicum</i>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	1-m ² <input type="checkbox"/> 10-m ² <input type="checkbox"/>	11	1 7 3
CT - Canopy Tree - Tallest canopy trees, upper tree layer formed by mature tree crowns; T - Mid-Canopy Tree - Typically > 4m; mid-canopy trees not reaching the upper canopy; S - Tall Shrub - ~2 to 4m; tall shrubs, tree saplings; LS - Low Shrub - 0.5-2.0m woody; medium shrubs, tree seedlings; G - Ground - all herbaceous species (except aquatic) regardless of height, shrubs and tree seedlings < 0.5m; SA - Submerged Aquatic - Submerged aquatic vegetation (rooted in the sediment, most of plant cover is submerged or floating on water); FA - Floating Aquatic - Floating aquatic vegetation (not rooted in sediment); LE - Lianas and epiphytes							

Figure 5-3. Example of filled-out Form V-2a – Species Presence and Cover.

**NWCA Field Operations Manual
Chapter 6 Training Packet**

Soils

**National Water Quality Monitoring Conference
April 25th, 2010**

PROTOCOL CHECKLISTS AND SUMMARIES

Checklist of steps for soil sampling from arrival on site to departure

- ☐ 1) Locate four distinct soil-sampling locations within the AA using decision criteria presented in section 6.1.1
- ☐ 2) Collect GPS positions for four pit locations (when working on individual pits).
- ☐ 3) Excavate four 60-cm pits and describe the profile, Hydric Soil Indicators, and stressors.
- ☐ 4) Select one of the four pits (randomly) and extend depth (by auger) to as close to 1.25 m as possible; describe profile and collect both bulk density (core) and nutrient/chemical samples (~ one quart of soil) for all horizons ≥ 8 cm thick.
- ☐ 5) Complete all forms in section 6.5.
- ☐ 6) Label soil specimen bags inside and out before leaving the site.
- ☐ 7) Measure pit for free water level and partial saturation level (before back-filling pit)
- ☐ 8) Refill excavations and replace vegetation cap
- ☐ 9) Inventory and clean tools before leaving AA

6.4 EQUIPMENT AND SUPPLIES

- ☐ Reference Card S-1
- ☐ Site packet documentation including a copy of the site soils map and NRCS soil survey information for the county where the site is located
- ☐ Four, 6 mil thick, black plastic sheets approx. 1.5m² each for laying out slabs
- ☐ Small scoop
- ☐ Plastic sample bags and waterproof labels (provided by NRCS)
- ☐ Soil bulk density core extractor with handle extensions
- ☐ Plastic or wood strips for marking soil horizons
- ☐ Pin flags or tall stakes (4) for marking soil pits
- ☐ Tote or pack to carry tools and small equipment
- ☐ Data forms (printed on waterproof paper)
- ☐ Pencils and permanent markers
- ☐ Sharp-shooter shovel
- ☐ Bucket auger
- ☐ Plane auger
- ☐ Peat sampler
- ☐ Cup cutter
- ☐ Cofferdam plastic sheet
- ☐ Hand bilge pump
- ☐ Pulaski or root-pruners (cutting tools for roots)
- ☐ Munsell color book
- ☐ 30 cm ruler
- ☐ Water spray bottle for moistening soil as needed
- ☐ Hand lens
- ☐ Metric tape measure
- ☐ Field book, Field Indicators of Hydric Soils in the United States (USDA, NRCS 2006)
- ☐ Knife or tool for shaving soil slices to expose fresh surface
- ☐ Paper towels

Soil Pit Placement

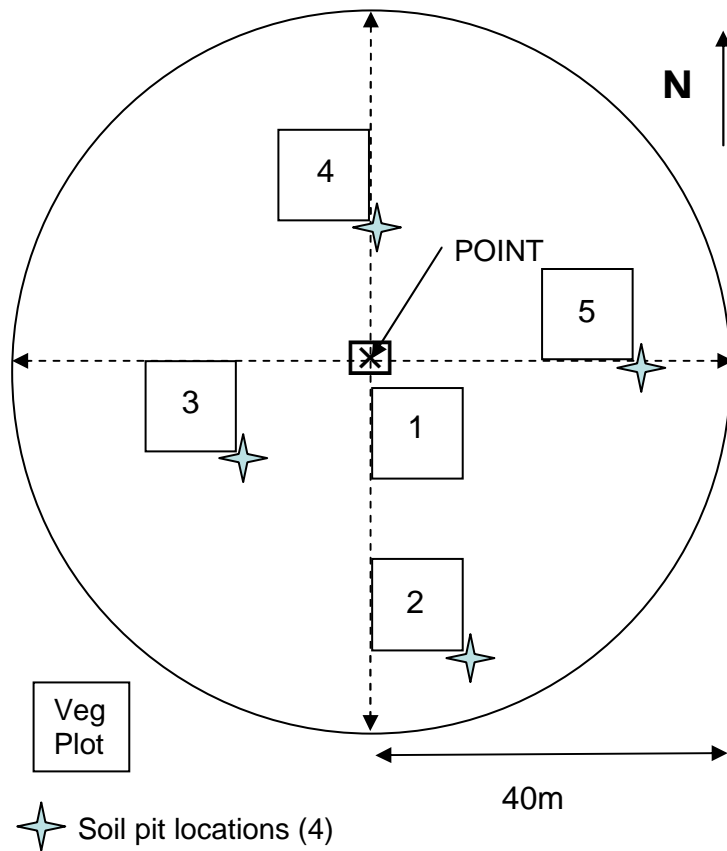


Figure 6-2. Standard 1/2 hectare circle assessment area layout with 5 Veg plots and 4 soil pits.

Reviewed by (initials):																									
NWCA SOIL PROFILE DATA FORM																									
Site Name:																				Date: / / 2011					
Site ID # :										Crew or Team (initials):															
Series or Component Name										Soil Survey (cite)															
Soil Pit # 1 Total pit depth =										Latitude (dd mm ss.ss)					Longitude										
Horizon Depth (cm)			Texture (check one)				% Rock fragments > 2 mm	% Roots	Check if either Boundary abrupt	% Pores	Matrix Color			Redoximorphic Features				For Notes use the back of the sheet and reference which soil pit the notes are for.							
	top	bottom	Sand	Clay / loamy	Organic	Mucky mineral					Concentrations Color			% of Hor	Depletions Color				% of Hor						
1										Hue	Val	Chr	Hue	Val	Chr		Hue		Val	Chr					
2																									
3																									
4																									
5																									
6																									
Soil Pit # 2 Total pit depth =										Latitude (dd mm ss.ss)					Longitude										
Horizon Depth (cm)			Texture (check one)				% Rock fragments > 2 mm	% Roots	Check if either Boundary abrupt	% Pores	Matrix Color			Redoximorphic Features											
	top	bottom	Sand	Clay / loamy	Organic	Mucky mineral					Concentrations Color			% of Hor	Depletions Color			% of Hor							
1																									
2																									
3																									
4																									
5																									
6																									
Soil Pit # 3 Total pit depth =										Latitude (dd mm ss.ss)					Longitude										
Horizon Depth (cm)			Texture (check one)				% Rock fragments > 2 mm	% Roots	Check if either Boundary abrupt	% Pores	Matrix Color			Redoximorphic Features											
	top	bottom	Sand	Clay / loamy	Organic	Mucky mineral					Concentrations Color			% of Hor	Depletions Color				% of Hor						
1																									
2																									
3																									
4																									
5																									
6																									
Soil Pit # 4 Total pit depth =										Latitude (dd mm ss.ss)					Longitude										
Horizon Depth (cm)			Texture (check one)				% Rock fragments > 2 mm	% Roots	Check if either Boundary abrupt	% Pores	Matrix Color			Redoximorphic Features											
	top	bottom	Sand	Clay / loamy	Organic	Mucky mineral					Concentrations Color			% of Hor	Depletions Color			% of Hor							
1																									
2																									
3																									
4																									

5																				
6																				

Soil Structure does not appear on this dataform but is being considered for inclusion

Reviewed by (initials): _____

NWCA HYDRIC SOIL INDICATORS AND WATER STATUS FORM

Site Name: _____

Date: __/__/2011

Site ID #: _____ Crew or Team (initials): _____

Soil Pit # 1

Hydric Soil Indicators				Water Level (cm)	
<input type="checkbox"/> Histosol (A1) <input type="checkbox"/> Histic Epipedon (A2) <input type="checkbox"/> Black Histic (A3) <input type="checkbox"/> Hydrogen Sulfide (A4) <input type="checkbox"/> Stratified Layers (A5) <input type="checkbox"/> Organic Bodies (A6) <input type="checkbox"/> 5 cm Mucky Mineral (A7) <input type="checkbox"/> Muck presence (A8) <input type="checkbox"/> 1 cm Muck (A9) <input type="checkbox"/> Depleted Below Dark Surface (A11) <input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Coast Prairie Redox (A16) <input type="checkbox"/> Sandy Mucky Mineral (S1) <input type="checkbox"/> 2.5 cm Mucky Peat or Peat (S2) <input type="checkbox"/> 5 cm Mucky Peat or Peat (S3) <input type="checkbox"/> Sandy Gleyed Matrix (S4) <input type="checkbox"/> Sandy Redox (S5) <input type="checkbox"/> Stripped Matrix (S6) <input type="checkbox"/> Dark Surface (S7) <input type="checkbox"/> Polyvalue Below Surface (S8) <input type="checkbox"/> Thin Dark Surface (S9) <input type="checkbox"/> Loamy Mucky Mineral (F1) *	<input type="checkbox"/> Loamy Gleyed Matrix (F2) <input type="checkbox"/> Depleted Matrix (F3) <input type="checkbox"/> Redox Dark Surface (F6) <input type="checkbox"/> Depleted Dark Surface (F7) <input type="checkbox"/> Redox Depressions (F8) <input type="checkbox"/> Vernal Pools (F9) <input type="checkbox"/> Marl (F10) <input type="checkbox"/> Depleted Ochric (F11) <input type="checkbox"/> Iron-Manganese Mass (F12) <input type="checkbox"/> Umbric Surface (F13) <input type="checkbox"/> High Plains Depressions (F16)	<input type="checkbox"/> Delta Ochric (F17) <input type="checkbox"/> Reduced Vertic (F18) <input type="checkbox"/> Piedmont Flood Plain Soils (F19) <input type="checkbox"/> Anomalous Bright Loamy Soils (F20) Indicators for problematic Hydric Soils <input type="checkbox"/> 2 cm Muck (A10) <input type="checkbox"/> Red Parent Material (TF2) <input type="checkbox"/> Other (explain in notes)	Not present (check)	
				Saturation Level (cm)	
				Not present (check)	
				Notes	

Soil Pit # 2

Hydric Soil Indicators				Water Level (cm)	
<input type="checkbox"/> Histosol (A1) <input type="checkbox"/> Histic Epipedon (A2) <input type="checkbox"/> Black Histic (A3) <input type="checkbox"/> Hydrogen Sulfide (A4) <input type="checkbox"/> Stratified Layers (A5) <input type="checkbox"/> Organic Bodies (A6) <input type="checkbox"/> 5 cm Mucky Mineral (A7) <input type="checkbox"/> Muck presence (A8) <input type="checkbox"/> 1 cm Muck (A9) <input type="checkbox"/> Depleted Below Dark Surface (A11) <input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Coast Prairie Redox (A16) <input type="checkbox"/> Sandy Mucky Mineral (S1) <input type="checkbox"/> 2.5 cm Mucky Peat or Peat (S2) <input type="checkbox"/> 5 cm Mucky Peat or Peat (S3) <input type="checkbox"/> Sandy Gleyed Matrix (S4) <input type="checkbox"/> Sandy Redox (S5) <input type="checkbox"/> Stripped Matrix (S6) <input type="checkbox"/> Dark Surface (S7) <input type="checkbox"/> Polyvalue Below Surface (S8) <input type="checkbox"/> Thin Dark Surface (S9) <input type="checkbox"/> Loamy Mucky Mineral (F1) *	<input type="checkbox"/> Loamy Gleyed Matrix (F2) <input type="checkbox"/> Depleted Matrix (F3) <input type="checkbox"/> Redox Dark Surface (F6) <input type="checkbox"/> Depleted Dark Surface (F7) <input type="checkbox"/> Redox Depressions (F8) <input type="checkbox"/> Vernal Pools (F9) <input type="checkbox"/> Marl (F10) <input type="checkbox"/> Depleted Ochric (F11) <input type="checkbox"/> Iron-Manganese Mass (F12) <input type="checkbox"/> Umbric Surface (F13) <input type="checkbox"/> High Plains Depressions (F16)	<input type="checkbox"/> Delta Ochric (F17) <input type="checkbox"/> Reduced Vertic (F18) <input type="checkbox"/> Piedmont Flood Plain Soils (F19) <input type="checkbox"/> Anomalous Bright Loamy Soils (F20) Indicators for problematic Hydric Soils <input type="checkbox"/> 2 cm Muck (A10) <input type="checkbox"/> Red Parent Material (TF2) <input type="checkbox"/> Other (explain in notes)	Not present (check)	
				Saturation Level (cm)	
				Not present (check)	
				Notes	

Soil Pit # 3

Hydric Soil Indicators				Water Level (cm)	
<input type="checkbox"/> Histosol (A1) <input type="checkbox"/> Histic Epipedon (A2) <input type="checkbox"/> Black Histic (A3) <input type="checkbox"/> Hydrogen Sulfide (A4) <input type="checkbox"/> Stratified Layers (A5) <input type="checkbox"/> Organic Bodies (A6) <input type="checkbox"/> 5 cm Mucky Mineral (A7) <input type="checkbox"/> Muck presence (A8) <input type="checkbox"/> 1 cm Muck (A9) <input type="checkbox"/> Depleted Below Dark Surface (A11) <input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Coast Prairie Redox (A16) <input type="checkbox"/> Sandy Mucky Mineral (S1) <input type="checkbox"/> 2.5 cm Mucky Peat or Peat (S2) <input type="checkbox"/> 5 cm Mucky Peat or Peat (S3) <input type="checkbox"/> Sandy Gleyed Matrix (S4) <input type="checkbox"/> Sandy Redox (S5) <input type="checkbox"/> Stripped Matrix (S6) <input type="checkbox"/> Dark Surface (S7) <input type="checkbox"/> Polyvalue Below Surface (S8) <input type="checkbox"/> Thin Dark Surface (S9) <input type="checkbox"/> Loamy Mucky Mineral (F1) *	<input type="checkbox"/> Loamy Gleyed Matrix (F2) <input type="checkbox"/> Depleted Matrix (F3) <input type="checkbox"/> Redox Dark Surface (F6) <input type="checkbox"/> Depleted Dark Surface (F7) <input type="checkbox"/> Redox Depressions (F8) <input type="checkbox"/> Vernal Pools (F9) <input type="checkbox"/> Marl (F10) <input type="checkbox"/> Depleted Ochric (F11) <input type="checkbox"/> Iron-Manganese Mass (F12) <input type="checkbox"/> Umbric Surface (F13) <input type="checkbox"/> High Plains Depressions (F16)	<input type="checkbox"/> Delta Ochric (F17) <input type="checkbox"/> Reduced Vertic (F18) <input type="checkbox"/> Piedmont Flood Plain Soils (F19) <input type="checkbox"/> Anomalous Bright Loamy Soils (F20) Indicators for problematic Hydric Soils <input type="checkbox"/> 2 cm Muck (A10) <input type="checkbox"/> Red Parent Material (TF2) <input type="checkbox"/> Other (explain in notes)	Not present (check)	
				Saturation Level (cm)	
				Not present (check)	
				Notes	

Soil Pit # 4

Hydric Soil Indicators				Water Level (cm)	
<input type="checkbox"/> Histosol (A1) <input type="checkbox"/> Histic Epipedon (A2) <input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Coast Prairie Redox (A16) <input type="checkbox"/> Sandy Mucky Mineral (S1) <input type="checkbox"/> 2.5 cm Mucky Peat or Peat (S2)	<input type="checkbox"/> Loamy Gleyed Matrix (F2) <input type="checkbox"/> Depleted Matrix (F3) <input type="checkbox"/> Redox Dark Surface (F6)	<input type="checkbox"/> Delta Ochric (F17) <input type="checkbox"/> Reduced Vertic (F18) <input type="checkbox"/> Piedmont Flood Plain Soils (F19)	Not present (check)	
				Saturation Level (cm)	

<input type="checkbox"/> Hydrogen Sulfide (A4) <input type="checkbox"/> Stratified Layers (A5) <input type="checkbox"/> Organic Bodies (A6) <input type="checkbox"/> 5 cm Mucky Mineral (A7) <input type="checkbox"/> Muck presence (A8) <input type="checkbox"/> 1 cm Muck (A9) <input type="checkbox"/> Depleted Below Dark Surface (A11) <input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> 5 cm Mucky Peat or Peat (S3) <input type="checkbox"/> Sandy Gleyed Matrix (S4) <input type="checkbox"/> Sandy Redox (S5) <input type="checkbox"/> Stripped Matrix (S6) <input type="checkbox"/> Dark Surface (S7) <input type="checkbox"/> Polyvalue Below Surface (S8) <input type="checkbox"/> Thin Dark Surface (S9) <input type="checkbox"/> Loamy Mucky Mineral (F1) *	<input type="checkbox"/> Depleted Dark Surface (F7) <input type="checkbox"/> Redox Depressions (F8) <input type="checkbox"/> Vernal Pools (F9) <input type="checkbox"/> Marl (F10) <input type="checkbox"/> Depleted Ochric (F11) <input type="checkbox"/> Iron-Manganese Mass (F12) <input type="checkbox"/> Umbric Surface (F13) <input type="checkbox"/> High Plains Depressions (F16)	<input type="checkbox"/> Anomalous Bright Loamy Soils (F20) Indicators for problematic Hydric Soils <input type="checkbox"/> 2 cm Muck (A10) <input type="checkbox"/> Red Parent Material (TF2) <input type="checkbox"/> Other (explain in notes)	Not present (check)	Notes
--	---	--	--	---------------------	-------

* Except MLRA 1

Reviewed by (initials):

NWCA SOIL STRESSORS FORM

Site Name:

Site ID#:

Soil Pit # 1

<input type="checkbox"/> Sedimentation	Notes
<input type="checkbox"/> Erosion	
<input type="checkbox"/> Plowing	
<input type="checkbox"/> Ditching	
<input type="checkbox"/> Subterranean drainage modifications	
<input type="checkbox"/> Substrate removal (excavation)	
<input type="checkbox"/> Deposition (fill)	
<input type="checkbox"/> Traffic compaction	
<input type="checkbox"/> Grazing compaction	
<input type="checkbox"/> No Stressors present	

Soil Pit # 2

<input type="checkbox"/> Sedimentation	Notes
<input type="checkbox"/> Erosion	
<input type="checkbox"/> Plowing	
<input type="checkbox"/> Ditching	
<input type="checkbox"/> Subterranean drainage modifications	
<input type="checkbox"/> Substrate removal (excavation)	
<input type="checkbox"/> Deposition (fill)	
<input type="checkbox"/> Traffic compaction	
<input type="checkbox"/> Grazing compaction	
<input type="checkbox"/> No Stressors present	

Soil Pit # 3

<input type="checkbox"/> Sedimentation	Notes
<input type="checkbox"/> Erosion	
<input type="checkbox"/> Plowing	
<input type="checkbox"/> Ditching	
<input type="checkbox"/> Subterranean drainage modifications	
<input type="checkbox"/> Substrate removal (excavation)	
<input type="checkbox"/> Deposition (fill)	
<input type="checkbox"/> Traffic compaction	
<input type="checkbox"/> Grazing compaction	
<input type="checkbox"/> No Stressors present	

Soil Pit # 4

<input type="checkbox"/> Sedimentation	Notes
--	-------

	Erosion	
	Plowing	
	Ditching	
	Subterranean drainage modifications	
	Substrate removal (excavation)	
	Deposition (fill)	
	Traffic compaction	
	Grazing compaction	
	No Stressors present	

Reviewed by (initials):							
NWCA SOIL SAMPLE FORM							
Site Name:					Date: / / 2011		
Soil Pit #							
Circle for sample status for each layer							
Layer	Horizon	Layer ≥ 8 cm thick	Chemical and Nutrient Sample collected	Bulk Density Sample Collected (3 from each layer)		Sample Collection Number(s)	Notes
				Core	Volume (cm ²)		
1		Y N	Y N	1			
				2			
				3			
2		Y N	Y N	1			
				2			
				3			
3		Y N	Y N	1			
				2			
				3			
4		Y N	Y N	1			
				2			
				3			
5		Y N	Y N	1			
				2			
				3			
6		Y N	Y N	1			
				2			
				3			

Reference Card S-1

Equipment and documentation necessary to collect soil data:

- ___ Site packet documentation including a copy of the site soils map and NRCS soil survey information for the county where the site is located
- ___ Four, 1 m² 6 mil thick, black plastic sheets approx. 1.5 m square
- ___ Four pin flags with numbers 1, 2, 3, 4 in marker
- ___ Plastic sample bags and labels
- ___ Data forms
- ___ 30 cm ruler
- ___ Pencil and indelible marker
- ___ Sharp-shooter shovel
- ___ 1 Bucket auger
- ___ 1 Planer auger
- ___ 1 Peat sampler head
- ___ 1 Cup Cutter
- ___ 1 PK tube soil extractor
- ___ 3 PVC Isotope collection tubes and caps
- ___ 1 Hammered core sampler
- ___ 4 Extension handles for augers and corer
- ___ 1 Hand water pump
- ___ 1 Child's snow sled
- ___ 1 Cofferdam flashing (plastic or 7 inch aluminum flashing or ?)
- ___ Sharp-shooter shovel
- ___ Pulaski (cutting tool for roots)
- ___ Munsell color book
- ___ Water bottle for moistening soil as needed
- ___ Hand lens
- ___ Tape measure
- ___ Field book, Field Indicators of Hydric Soils in the United States (USDA and NRCS 2006)
- ___ 25cm knife for shaving soil slabs to expose fresh surface
- ___ Paper towels

Locating the pits: At or as close as possible to the SE-most corner of 4 Veg plots farthest from the AA CENTER. Place a numbered pin flag at each pit.

Soil Horizons:

- O – topmost horizon consisting of accumulations of organic inputs
- A – the first mineral horizon and generally has significant organic matter
- E – a horizon that exhibits significant loss of organic matter, Fe, Al, and/or clays
- B – mainly mineral and may have additional accumulations of Fe, Al, Si, and/or humus
- C – mineral soil, soft bedrock, a layer little affected by pedogenesis and lack properties of O, A, E, or B horizons
- L – limnic materials (organic and inorganic materials deposited via water by precipitation or derived from underwater and floating aquatic plants and aquatic animals)

R – rock horizon

W - a layer of water found under floating but fixed vegetation

Page 1 of 2

Horizons(layers) are marked at the top:

- Number 1= O horizon
- Number 2 = A horizon
- Number 3 = E horizon
- Number 4 = B horizon
- Number 5 = C horizon
- Number 6 = unknown

Soil profile data form:

Identify horizon; record dept; texture; % rock fragments > 2 mm; % roots, boundary abruptness; % pores; matrix color; and redoximorphic features.

Hydric Soil Indicators and water status form:

Check applicable Hydric Soil Indicators (generally related to the entire profile but note when they are applied to specific horizon(s)).

Water infiltration after digging the soil pits:

Measure from the surface down and record the value as a negative number. Check all pits before back-filling pits to measure any water that has accumulated. Check if no standing water is present. If there is obvious water exudate on the pit walls or wetted versus dry zones, measure the depth that it begins and record it as the saturation level.

Soil Stressors form:

Check applicable soil stressors within a 5 m radius of the soil pit or check 'no stressors present'.

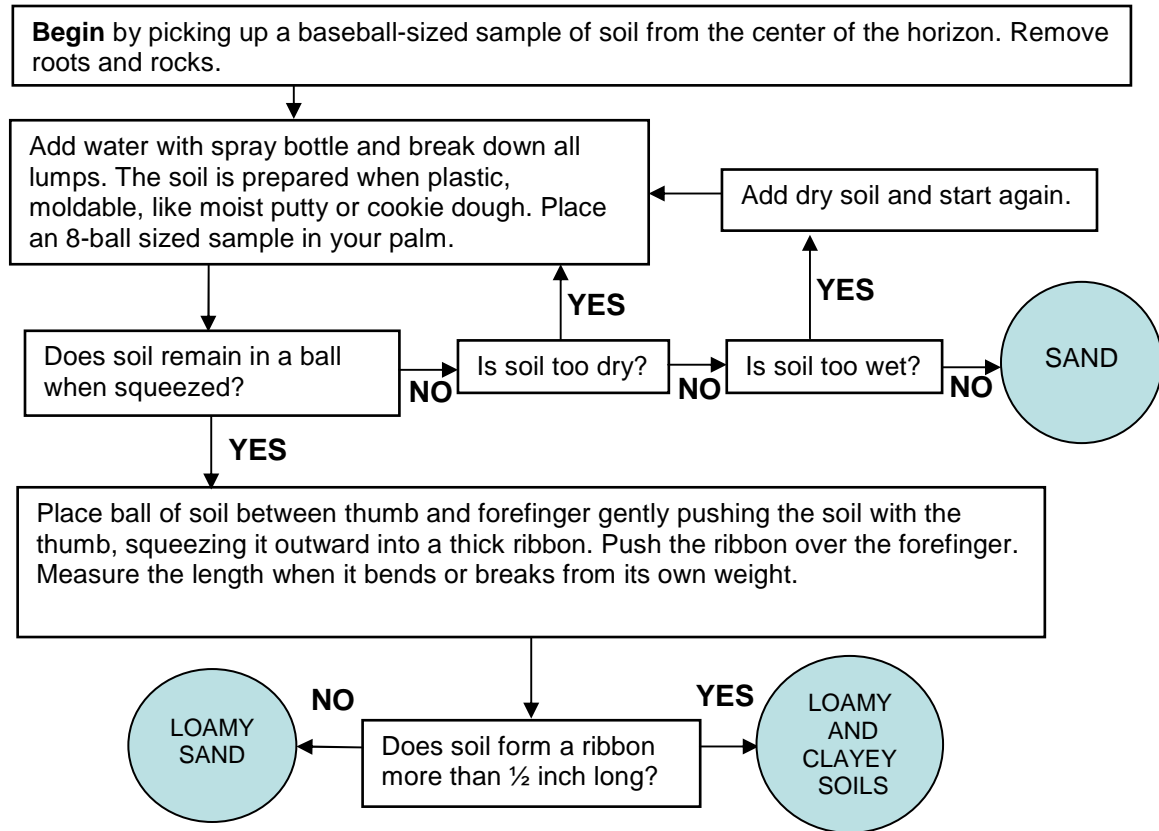
Soil sample form:

Record site ID, soil horizon, layer attributes, sample status, and collection date on the plastic sample bag with an indelible felt-tipped pen and add a waterproof paper or plastic label with the same information inside the bag. For bulk density samples additional labeling includes 'BD' and the volume in cm².

For chemical and nutrient analysis – Collect ~ quart of soil from each distinct horizon.

For bulk density collect 3 hammered cores or peat cores of soil from each horizon, measured for volume and composited in one bag.

For isotope analysis collect 3 pvc tubes from the top 10cm after removing loose litter. Place all 3 in single plastic bag and label the bag with site, date, and "Isotopes"

Mineral Soil Texture**Organic Soil Texture****Percent (%) of visible fibers**

Peat	> 40%
Mucky peat	20 - 40
Muck	< 20

**NWCA Field Operations Manual
Chapter 7 Training Packet**

Hydrology

**National Water Quality Monitoring Conference
April 25th, 2010**

7.3 PROTOCOL CHECKLISTS AND SUMMARIES

1. Arrive on site, Veg team finds the POINT, determine the AA and Vegetation Plots.
2. AB team walks the perimeter of the AA to identify water sources for the AA (while beginning to collect buffer information).
3. Use the hydrology data form to identify and record any hydrology stressors found present in the AA.
4. Search for drift lines and record findings.
5. Determine the percent surface water inundation across the AA.
6. At the end of the day just prior to filling in the 4 soil pits, measure the distance from the soil surface down to the surface of the groundwater in each pit and record on data form.

7.4 EQUIPMENT AND SUPPLIES

- ___ Pencils
- ___ Data Form
- ___ 1 Telescoping surveyors rod (for surface water depth, ditch depth)
- ___ 1 ski pole marked in 1cm and 10cm gradations
- ___ 50 m measuring tape

7.5 HYDROLOGY DATA FORM

Reviewed by (initials): _____

Page 1 of 2

NWCA Hydrology Assessment Area Form

Site Name _____

Date ____/____/____

Site ID # _____

Crew or Team (initials): _____

Identify and Enumerate (Rank (1 =strongest) top 3 sources_by perceived influence) for water sources and hydrologic alterations

<u>Water Sources/Flux</u>	<u>QTY</u>	<u>Top 3</u>
<u>Inputs</u>		
Inlet streams	_____	_____
Tidal channel	_____	_____
Springs	_____	_____
Ocean	_____	_____
Ditches	_____	_____
Culverts	_____	_____
Pipes	_____	_____
<u>Outflow</u>		
Outlets	_____	_____

ID outflow type:

O -Stream O -Ditch O -Culvert
O -Pipe O -Other

AA Hydrology Stressors

	<u>QTY</u>	<u>Top 3</u>
Damming Features (dikes/ berms, dams, roads, RR bed, fill)	_____	_____
Ditches	_____	_____
Deepest Ditch Depth (m)	_____	_____
Depth 1	_____	_____
Depth 2	_____	_____
Depth 3	_____	_____
Field Tiling (mark if present)	O	_____
Excavation/Dredging	O	_____

Fresh Sediment Influx (% of AA recently covered by sediment)

<u>Percent</u>	<u>Fill in bubble</u>	
None 0	O	_____
Very Low $0 \leq x \leq 5$	O	_____
Low $6 \leq x \leq 10$	O	_____
Medium $10 < x \leq 30$	O	_____
High $30 < x \leq 50$	O	_____
Very High $x > 50$	O	_____
<u>Other</u> (eg. impervious surface – roads)	O	_____

Drift Lines

Fill if Present

Leaf packs (caught in vegetation)	O
Plant Detritus/Tidal Wrack	O
Anthropogenic Trash (part of wrack or detritus)	O

AA Surface Water (areal extent)

None present

Percent AA with Surface water	_____	O

Soil Pit Water Depth (surface to top of groundwater)

	<u>Depth (cm.)</u>	<u>Not enough time to fill</u>	<u>No water present</u>
Pit 1	_____	O	O
Pit 2	_____	O	O
Pit 3	_____	O	O
Pit 4	_____	O	O

**NWCA Field Operations Manual
Chapter 8 Training Packet**

Water Quality

**National Water Quality Monitoring Conference
April 25th, 2010**

8.4 PROTOCOL CHECKLIST AND SUMMARIES

1. If surface water is available and meets the criteria for sampling, determine a location for collecting the surface water sample from within the AA, but outside of the Vegetation Plots after the AA and vegetation plots are delineated. Clearly mark these with flagging to keep foot traffic away to avoid water quality being impaired by the crew moving around the AA until the samples are collected.
2. The surface water sampling should occur prior to 11:00am in all locations except tidal areas. In tidal influenced locations, take the sample as soon after entering the site based upon tidal stage. Take the sample as soon as possible after the AA and Vegetation Plot are established,
3. Take water quality measurements with the multi probe field meter.

8.5 WATER QUALITY EQUIPMENT AND SUPPLIES (checklist)

- ___ 1 Containers (collapsible cubitainer) for surface water sample
- ___ 50 ml bottle for second water sample) (isotope sample for Renee Brooks)
- ___ Long-handled plastic dipper (Figure 8.3 Schematic)
- ___ Paper Towels
- ___ Large dark plastic bags
- ___ Quart ziplock bags
- ___ Disposable nitrile/latex gloves
- ___ Clear Tape Strip packs for covering labels
- ___ De-ionized (DI) water in carboy
- ___ Squirt/squeeze bottle of DI water
- ___ Small, soft-sided cooler w/ blue ice to fit (for sites not close to vehicle)
- ___ Large cooler with ice at vehicle
- ___ Water Quality Form
- ___ No. 2 Pencils
- ___ Fine tip permanent marker for labels
- ___ Multi-Probe Field Meter (DO, pH, Cond., Temp)
- ___ Field meter calibration kit (can be contained in a good quality, plastic box, e.g. tackle box) and should contain:
 - calibration cup with removable cove, DO membranes, backup probes and spare parts (o-rings, etc).
 - pH buffers
 - thermometer
 - squeeze bottle
 - Appropriate size leak-proof, screw-cap containers (e.g. nalgene) for additional calibration solutions
 - Basic tools (assorted screwdrivers, allen wrenches)

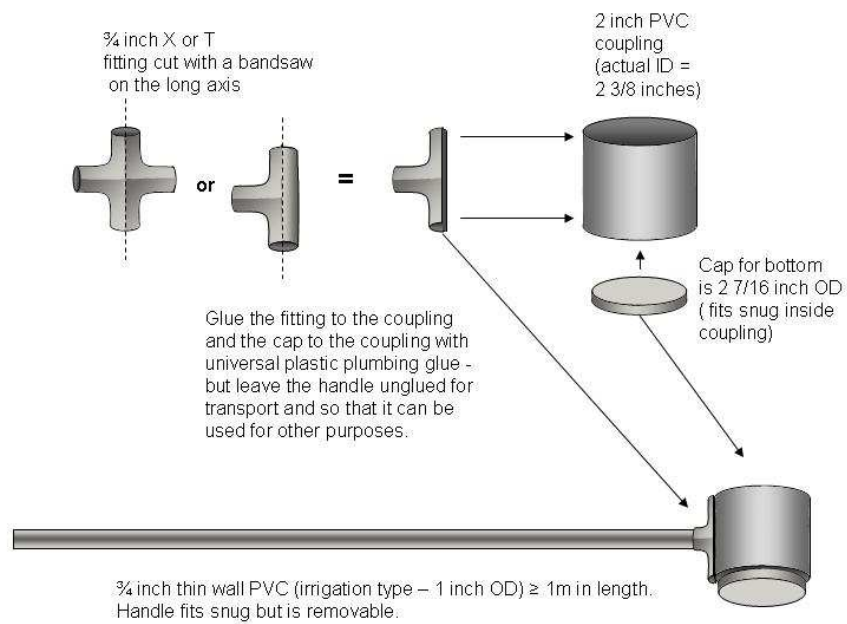


Figure 8.3 Exploded schematic for Water Scoop

8.6 DATA FORMS

Reviewed by (initials): _____		Page 1 of 1	
NWCA Water Quality Field Form			
Site Name _____		Date ____/____/____	
Site ID #: _____		Crew or Team (initials): _____	

SURFACE WATER (SW)	Flag	Field Calibration
Mark if sample collected	<input type="radio"/> Yes <input type="radio"/> No	Calibration performed
(fill in appropriate bubble)		
Estimated Water Depth (cm)	____.____	Isotope Sample Collected (50ml)
Time of collection (military time)	____.____	
SW Field Probe Readings:		
Dissolved Oxygen (mg/l)	____.____	
pH	____.____	
Conductivity (uS/cm)	____.____	
Temperature °C	____.____	

General Description (color, flow, odor, and evidence of disturbance) Additional Comments:

SECTION BREAK

**NWCA Field Operations Manual
Chapter 9 Training Packet**

Algae

**National Water Quality Monitoring Conference
April 25th, 2010**

9.4 PROTOCOL CHECKLIST AND SUMMARY FOR ALGAE

1. Identify habitats to be sampled.
2. Collect taxonomic sample using core for benthic samples (either wet or dry surface. brushings/scrapings either from subsurface wetted/inundated sediments and vegetation stems/leaves, or from now dry locations where standing water was present earlier in the season in the AA.
3. Record on the Algae Data form the habitats sampled and whether the sample was collected from subsurface substrate or from a dry exposed soil surface.
4. Mix benthic/sediment composite subsamples in a 1 liter bottle filled to approximately 450ml full with water by shaking to homogenize the composite sample.
5. Take a 50ml algae toxin sediment subsample.
6. Repeat 5 subsamples for epiphyte subsample and fill bottle to 350ml.
7. Take a 50ml algae toxin epiphyte subsample.
8. Combine epiphyte composite sample in sediment composite sample.
5. Fill a 125-ml bottle to the shoulder with a combined composite subsample for taxonomic analysis and preserve with 2 ml. 10% buffered Formalin solution or Lugol's solution. Seal caps with tape. Place sample bottle in labeled box in vehicle.
6. Filter algae for the Chlorophyll a subsample onto glass fiber filter; put the filter in a small vial with label affixed, and wrap in foil. Place sample in labeled ziplock bag
7. Place chlorophyll a sample on ice immediately.
8. Record site and sample information for each sample collected on a Algae field data form.
9. Prepare sample log sheet and samples for shipping to the laboratory.

9.5 ALGAE EQUIPMENT AND SUPPLIES

- _____ 10% buffered formalin solution with aliquot disburser
- _____ Lugol's solution with aliquot disburser for state crews not using formalin.
- _____ Long Handled Dipper
- _____ Magnesium Carbonate ($MgCO_3$) solution in dropper bottle
- _____ Funnel
- _____ One 125ml bottles with screw lid
- _____ 3 60 ml screwcap bottles (two for algae toxin samples and one for chlorophyll a)
- _____ 2, 1 Liter bottles (for composite sample and for phytoplankton algae sample)
- _____ 500ml bottle (epiphyte algae sample)
- _____ Aluminum foil (to wrap Chlorophyll a sample vial).
- _____ 0.45 μm Glass filters (47mm diam. Filters to fit filter flask)
- _____ Portable vacuum filter flask)
- _____ Hand-operated PVC vacuum pump (e.g. Nalgene)
- _____ Tygon tubing
- _____ Flat forceps
- _____ Tissue paper
- _____ Plastic or stainless steel spatula like scraper
- _____ Scissors (for cutting vegetation stems for easier epiphytic algae collection)
- _____ Cut and sharpened plastic pipe cross section (1"length of 1.0 in. diam. clear Acrylic pipe)
- _____ Small flat plastic card (credit card sized) for containing pipe core sample.
- _____ Soft bristled toothbrush

- _____ Whirl-Pak or Ziploc bag to put Chlorophyll a in vial in prior to shipping
- _____ Foil squares for covering Chlorophyll a bottle.
- _____ Squirt bottle (for site water)
- _____ De-ionized (DI) water carboy filled with DI water
- _____ DI squirt bottle
- _____ Labels for sample identifications
- _____ No. 2 pencil & permanent marker
- _____ Ice chest with ice or dry ice
- _____ Forms & Labels



Figure 9. X. Lugols concentrations (left to right). too little solution, correct concentration looking like weak tea, right bottle with too much Lugol's added.

Reviewed by (initials): _____

Page 1 of 1

Site Name _____

NWCA Algae Form

Date ____/____/____

Site ID #: _____

Crew or Team (initials): _____

Taxonomic ID Sample			Biomass: Chlorophyll a Sample	
Fill in if present	Habitat Type	# Subsamples	Milliliters filtered	Fill in Bubble
<input type="radio"/>	Surface water present in AA <i>Subsurface sample</i>		500 ml.	<input type="radio"/>
<input type="radio"/>	Epiphytic		Less than 500ml Record filtered volume below	<input type="radio"/>
<input type="radio"/>	Benthic		Amount filtered (ml)	____
<input type="radio"/>	No Surface Water in AA: <i>Exposed soil samples</i>	Do not take if surface water present		
<input type="radio"/>	Vegetation Epiphytes		Algae Toxin Samples Collected	
<input type="radio"/>	Soil		Sediment sample	Yes <input type="radio"/> No <input type="radio"/>
TOTAL # Subsamples $\Sigma =$			Sediment Composite Volume (ml)	
			Epiphyte sample	Yes <input type="radio"/> No <input type="radio"/>
			Epiphyte Composite Volume (ml)	
Volume of composite sample with water in 1 liter bottle (ml)		____		
Comments:				